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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 10, NUMBER 1
JANUARY 1, 1977

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 1
JANUARY 1, 1977

W77-00001 -- W77-00525

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture

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07 RESOURCES DATA
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ABSTRACT SOURCES

2. WATER CYCLE

2A. General

STOCHASTIC CONSIDERATIONS IN THUNDERSTORM MODELING,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-00087

A NOMOGRAM TO ESTIMATE THE HEAT-EXCHANGE COEFFICIENT AT THE AIR-WATER INTERFACE AS A FUNCTION OF WIND SPEED AND TEMPERATURE; A CRITICAL SURVEY OF SOME LITERATURE,
Keuring van Electrotechnische Materialen N. V., Arnhem (Netherlands). Environmental Dept.
For primary bibliographic entry see Field 2D.
W77-00130

CATCHMENT MODELING AND INITIAL PARAMETER ESTIMATION FOR THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM,
National Weather Service, Washington, D.C. Office of Hydrology.
E. I. Peck.
NOAA Technical Memorandum NWS HYDRO-31, June 1976. 24 p, 5 fig, 6 ref, 4 append.

Descriptors: *River forecasting, *Soil moisture, *Watersheds(Basins), *Evapotranspiration, *Streamflow, Data processing, Groundwater, Percolation, *Model studies, Hydrology, Calibrations, Drainage, *Oregon, Precipitation(Atmospheric).
Identifiers: Catchment models, *South Yamhill River(OR).

The two papers in this technical memorandum were prepared for the International Symposium and Workshop on the Application of Mathematical Models in Hydrology and Water Resources Systems held in Bratislava, Czechoslovakia on 8-13 September 1975. The first 'Catchment Modeling with the United States National Weather Service River Forecast System' describes the system (NWSRFS) of conceptual hydrologic models and other procedures, used in the operational river forecasting program of the United States National Weather Service. A major revision has been made in the soil moisture accounting for the catchment model. The components for soil moisture accounting of the Sacramento Model have replaced those of the modified Stanford Model as used in the original system. The conceptual features and characteristics of the Sacramento Model are discussed. The second paper is titled: 'Calibration of National Weather Service River Forecast System: Initializing Parameters for the Catchment Model'. The use of the catchment model in the NWSRFS requires the determination of 16 model parameters. The calibration process is greatly enhanced if rational initial estimates of model parameters can be found. Techniques are developed to derive initial parameter estimates directly from the hydrometeorological data base of a catchment. Step by step demonstrations of the estimation procedure are included. (NOAA)
W77-00272

THE IMPACT OF MAN ON THE WORLD NITROGEN CYCLE,
Purdue Univ., Lafayette. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5A.
W77-00312

LINK SLOPE DISTRIBUTION IN CHANNEL NETWORKS,
Brock Univ., St. Catherines (Ontario). Dept. of Geological Sciences.
J-J. Fling.
Water Resources Research, Vol. 12, No. 4, p 645-654, August 1976. 8 fig, 3 tab, 16 ref.

Descriptors: *Channel morphology, *Drainage systems, *Slopes, *Distribution patterns, *River basins, Gradients(Streams), Frequency curves, Data collections, Geologic control, Statistics, Histograms, Equations, Model studies, Appalachian Mountain Region.
Identifiers: *Link slope, *Appalachian Plateau, Skewed distribution, Stream order, Channel network.

The link slope distribution for given magnitude links from 18 basins in the Appalachian Plateau change from a left skewed, to a normal, to a right skewed distribution resembling a log normal distribution as the average stream gradient decreases. Variations in the link slope distribution can be partly explained by the decrease in the tendency of streams to move downward with a change in available relief or distance and by the effects of local geologic and geomorphic conditions prevailing in a basin. Downstream interior link slopes vary with magnitude following a power function. Their scatter about the log of the power function is constant in most basins. Based on these elementary properties of link slopes and the probability of occurrence of links of any one magnitude, a general model representing the distribution and expectation of interior link slopes for an entire channel network was formulated. The observed interior link slope distributions for different basins varied in shape from a monotonic decrease in frequencies with increasing stream gradient to a unimodal and sometimes bimodal distribution when exterior links were included. In spite of the large changes in the shape of the histograms for different basins, the theoretical distributions provided a good reproduction of the data. (Singh-ISWS)
W77-00370

DATA PROCESSING: A REVIEW OF THE ROLE OF THE MINISTRY OF WORKS AND DEVELOPMENT,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 7C.
W77-00378

2B. Precipitation

STOCHASTIC CONSIDERATIONS IN THUNDERSTORM MODELING,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
R. B. Corotis.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY7, Proceedings Paper 12231, p 865-879, July 1976. 8 fig, 1 tab, 33 ref, 2 append. NSF GK-37442.

Descriptors: *Model studies, *Rainfall, *Hydraulics, *Mathematical models, Probability, Stochastic processes, Hydrology, Statistical models, Thunderstorms, Storms, Storm runoff, Meteorology.

A mesoscale stochastic model of thunderstorm activity was developed to simulate the hourly development of both air mass and squall-line storms. This modeling technique was based on Poisson occurring thunderstorms, Markov cloud formation and movement, and rainfall-producing convective cells, and was intended to provide a more complete theoretical understanding of the thunderstorm process. The rain cells formed according to a prescribed probabilistic model within clouds on an hourly basis, with a relatively high likelihood of generation of a new cell in the vicinity of a previous cell. The cells were described by a center magnitude with a Gumbel distribution and an exponential or power law decay formula. The stochastic model was programmed for simulation in a fairly general program that allows many different variables in the thunderstorm process to be either prescribed, or simulated from appropriate probability distributions. (Sims-ISWS)
W77-00087

MEDIUM TERM FLUCTUATIONS OF RAINFALL IN SOUTHEASTERN ENGLAND,
University of East Anglia, Norwich (England). Climatic Research Unit.
B. M. Gray.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 433, p 627-638, July 1976. 3 fig, 9 tab, 6 ref.

Descriptors: *Model studies, *Rainfall, *Climatology, *Precipitation(Atmospheric), Monthly, Climatic data, Fluctuations, Distribution, Temporal distribution, Mathematical models, Forecasting, Meteorology.
Identifiers: *England, Power spectrum analysis.

An areal average data series based on 18 stations scattered throughout south and east England was set up. The incomplete gamma function was used as a model for the frequency distribution of the data since it gave good agreement with the parameters of the longest record in the area, Kew (1697-1971). The power spectrum of the areal average series showed that non-linear processes on a time scale of months or years may be involved in rainfall fluctuations. Decade average values of the total monthly rainfall of the area series were used to forecast decade mean monthly rainfall totals for 1970-1979, 1980-1989 and 1990-1999, using a mixed time series model. (Sims-ISWS)
W77-00092

FINAL REPORT ON AN INVESTIGATION OF PRECIPITATING ICE CRYSTALS FROM NATURAL AND SEEDED WINTER OROGRAPHIC CLOUDS,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W77-00096

A NOMOGRAM TO ESTIMATE THE HEAT-EXCHANGE COEFFICIENT AT THE AIR-WATER INTERFACE AS A FUNCTION OF WIND SPEED AND TEMPERATURE; A CRITICAL SURVEY OF SOME LITERATURE,
Keuring van Electrotechnische Materialen N. V., Arnhem (Netherlands). Environmental Dept.
For primary bibliographic entry see Field 2D.
W77-00130

THE DESIGN OF AN INEXPENSIVE RAIN GAGE WITH BOTH AMOUNT AND RATE CAPABILITIES,
Kansas Water Resources Research Inst., Manhattan.
D. H. Lenhert, and D. R. Hummels.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 770, Price codes: A05 in paper copy, A01 in microfiche. KWRRI Contribution No. 181, August 1976. 70 p, 27 fig, 3 tab, 5 ref, 6 append. OWRT A-073-KAN(1), 14-31-0001-6017.

Descriptors: *Instrumentation, *Rain gages, *Precipitation gages, *Rainfall intensity, Data storage and retrieval, Precipitation intensity, *Design, Watershed management, Costs.
Identifiers: Battery-operated cassette recorder, Remote data logger, Digital clocks, Precipitation patterns, *Rainfall rate, Recording rainfall gage, Remote location rain gage.

Researchers doing work in the general area of water resources often have need of precipitation data. The cost of presently available recording rain gages is high, approximately $1000. A prototype recording rain gage was built for less than $200. The prototype can provide both rainfall rate and total rainfall data in a form which is computer compatible. The prototype can operate on batteries in a remote location unattended for one month. The prototype uses a plastic tipping bucket to detect each .01 inch increment of rainfall. When an increment is detected, the time in month, day, hour, minute, and second given by a digital clock is stored in an inexpensive tape cassette storage system. A microprocessor-based system is used to recover the data. The total rainfall is accurate to within 5% of an official Weather Bureau gage with a time accuracy of better than five minutes per month. A complete description of the prototype with results of field tests and recommendations for future improvements is given.
W77-00160

MEASUREMENTS OF LIQUID WATER CONTENT IN WINTER CLOUD SYSTEMS OVER THE SIERRA NEVADA,
Nevada Univ., Reno. Desert Research Inst.
D. Lamb, K. W. Nielsen, H. E. Klieforth, and J. Hallett.
Journal of Applied Meteorology, Vol. 15, No. 7, p 763-775, July 1976. 12 fig, 9 ref. Bu. Rec. 14-06-D-6632.

Descriptors: *Clouds, *Precipitation(Atmospheric), *On-site investigations, *Aircraft, *California, Storms, Sampling, Cloud physics, Measurement, Winter, Data collections, Graphical analysis, Temperature, Dew point, Meteorological data, Meteorology, Nevada.
Identifiers: *Liquid water content, *Sierra Nevada, *Lake Tahoe, Aircraft observations.

Investigations of the structure and organization of synoptic-scale storms over the Sierra Nevada Mountain Range during two successive winters (1971-73) were made with a modified B-26 aircraft. Measurements of liquid water content, temperature, and dew point were made along horizontal traverses in a vertical plane oriented roughly perpendicular to the main crest and extending from Lake Tahoe to Sacramento, California. It was shown that the spatial distribution of liquid water was linked to the gross terrain features, as was the surface distribution of precipitation. The main centers of cloud liquid water content tended to form 40-75 km upwind of the main crest in highly convective cells. (Sims-ISWS)
W77-00164

A STUDY OF SOME EFFECTS OF VERTICAL SHEAR ON THUNDERSTORMS,
Tennessee Univ. Space Inst., Tullahoma.
J. Connell.
Report NASA CR-2647, January 1976. 112 p, 28 fig, 1 tab, 42 ref. NASA NAS8-31197.

Descriptors: *Thunderstorms, *Model studies, *Shear, *Weather, Tornadoes, Air circulation, Storms, Hail, Rain, Precipitation(Atmospheric), Winds, Meteorology.

Evidence was presented for the existence of vortices and vortex pairs in thunderstorms. A preliminary parameterized model of the nonthermal generation of thunderstorm vortices derived from field observations of storms and laboratory observations of a jet in cross-flow was reported, together with an explanation of how such a model might be used to guide analysis of mesoscale rawinsonde radar, and satellite data toward an improved capability for prediction of thunderstorm motion and growth. Preliminary analyses of radar and satellite data from Atmospheric Variability Experiment IV were used with available rawinsonde data to develop a correlation between wind shears, instability, and thunderstorm motion and development. Specific studies were recommended for best development of concept and utilization of data from Atmospheric Variability and Atmospheric Variability Severe Storms Experiments. (Sims-ISWS)
W77-00168

STATE OF SOUTH CAROLINA WEATHER AND CROP SUMMARIES,
South Carolina Water Resources Commission, Columbia.
For primary bibliographic entry see Field 3F.
W77-00282

PROJECT FOG DROPS V - TASK I: A NUMERICAL MODEL OF ADVECTION FOG, TASK II: RECOMMENDATIONS FOR SIMPLIFIED INDIVIDUAL ZERO-GRAVITY CLOUD PHYSICS EXPERIMENTS,
Calspan Corp., Buffalo, N. Y.
C. W. Rogers, W. J. Eadie, U. Katz, and W. C. Kocmond.
Report NASA CR-2633, December 1975. 79 p, 3 fig, 3 tab, 35 ref, 1 append. NASA NAS8-30776.

Descriptors: *Model studies, *Fog, *Oceans, *Cloud physics, Mathematical models, Droplets, Moisture, Humidity, Temperature, Cooling, Winds, Atmosphere, Computer models, Computer programs, Oceanography, Meteorology.
Identifiers: *Advective fog, *Marine fog, Fog models.

A two-dimensional, numerical model was used to investigate the formation and development of advection fog over the ocean. The model predicted the evolution of potential temperature, horizontal wind, water vapor content, and liquid water content in a vertical cross section of the atmosphere as determined by vertical turbulent transfer and horizontal advection, as well as radiative cooling and drop sedimentation in fog. The model was designed to simulate the formation, development, or dissipation of advection fog in response to transfer of heat and moisture between the atmosphere and the surface as driven by advection over horizontal discontinuities in the surface temperature. Results from numerical simulations of advection fog formation and development were discussed with reference to observational studies of marine fog. Recommendations were presented for an additional numerical modeling investigation to resolve some discrepancies between the predictions of the model and observations of advection fog formation and development over the ocean. A survey of candidate fog or cloud microphysics experiments which might be performed in the low gravity environment of a shuttle-type spacecraft was presented. Recommendations were given for experiments which were relatively simple in nature and relevant to fog modification problems. The appendix contained the model computer program. (Sims-ISWS)
W77-00357

CLIMATOLOGICAL NUMERICAL MODELS OF THE SURFACE MIXED LAYER OF THE OCEAN,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2L.
W77-00361

MAPPING RUNOFF-PRODUCING ZONES IN HUMID REGIONS,
McGill Univ., Montreal (Quebec). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W77-00368

THE VARIABILITY OF MONTHLY RAINFALL IN SOUTH AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Mathematical Statistics.
E. A. Cornish.
CSIRO Australia Division of Mathematical Statistics, Technical Paper No. 41, 1976. 42 p, 8 fig, 10 tab, 17 ref, 20 maps, append.

Descriptors: *Rainfall, *Frequency analysis, *Variability, *Period of growth, *Monthly, Rainfall disposition, Seasonal, *Australia, Autumn, Winter, Statistical methods, Distribution patterns, Wheat, Crop production.
Identifiers: South Australia.

A characteristic feature of autumn weather over a large proportion of the southern Australian wheat belt is that suitable conditions for seeding, germination and early growth are confined to a very limited period; the reliability of rainfall in this period is of paramount importance in providing a favourable start for the crop. The properties of the statistical distribution of monthly rainfall for all months of the year at all observing stations in South Australia have been investigated with the ultimate object of determining the probabilities of obtaining winter rainfall seasons of specifid types. Effective rainfalls are calculated according to Prescott's empirical formula, and the probability of obtaining a growing season of given duration beginning in a given autumn month is determined for each observing station. Isopleths of probability have been constructed for the various types of season. Exact fiducial limits for the probabilities are calculated. Similarly effective monthly rainfalls and their exact fiducial limits are calculated for assigned probabilities. (CSIRO)
W77-00443

2C. Snow, Ice, and Frost

ON THE FRACTURE PROPERTIES OF SNOW,
Montana State Univ., Bozeman.
R. L. Brown, and T. E. Lang.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 424, Price codes: A02 in paper copy, A01 in microfiche. Report No. ARO 11042.1-EN, 1975. 12 p, 5 fig, 2 tab, 8 ref. Also in: Snow Mechanics-Symposium, (Proceeding of the Grindelwald Symposium, April 1974, IAHS-AISH Publ. No. 114, 1975, p. 196-207. DA-ARO-D-31-124-73-G175, NSF GA-3943.

Descriptors: *Snow, *Energy, *Energy dissipation, *Free energy, Failure(Mechanics), Deformation, Mechanical properties, Snowpacks, Snow cover, Equations, Mathematical models, Laboratory tests, Stress.
Identifiers: *Snow fractures, Fracture properties.

The fracture characteristics of gradient metamorphosed snow were investigated and interpreted in terms of free energy and energy dissipation within the material. Utilizing continuum thermodynamics, the Helmholtz free energy was developed as a material potential and then used to calculate both free energy and energy dissipation during deformation. Values of these variables at fracture after variable deformation paths were then used to characterize a fracture criterion of snow in terms of dissipation and free energy. A constitutive equation for this type of snow was also developed and reported. (Sims-ISWS)
W77-00083

A CONCEPTUAL MODEL OF OFFSHORE PERMAFROST,
Alaska Univ., College. Geophysical Inst.
T. Osterkamp.
The Northern Engineer, Vol. 7, No. 4, p 5-10, Winter 1975-76. 8 fig, 11 ref. NOAA 40-3-158-41.

Descriptors: *Permafrost, *Erosion, *Coasts, *Alaska, Cold regions, Beaches, Freezing, Ice, Sea ice, Sea water, Temperature, Water temperature, Model studies, Waves(Water).
Identifiers: *Offshore permafrost, Sub-sea permafrost, Bonded permafrost.

The coastal erosion process was examined for the northern Alaskan coast for the purpose of developing a conceptual model of offshore permafrost. A series of as many as five stages of coastal erosion, which were characterized by different thermal and chemical boundary conditions, were necessary to describe the physical setting of the offshore permafrost. The seasonal variations of the thermal and chemical boundary conditions were discussed and it was suggested that these varying boundary conditions can be incorporated into a model of offshore permafrost consisting of the generalized transport equations from non-equilibrium thermodynamics by successively applying the transport equations to the five stages experienced by a vertical soil profile during the erosion process. (Sims-ISWS)
W77-00094

FINAL REPORT ON AN INVESTIGATION OF PRECIPITATING ICE CRYSTALS FROM NATURAL AND SEEDED WINTER OROGRAPHIC CLOUDS,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W77-00096

BEHAVIORAL CHARACTERISTICS AND CLEANUP TECHNIQUES OF NORTH SLOPE CRUDE OIL IN AN ARCTIC WINTER ENVIRONMENT,
Department of Transportation, Washington, D. C.; and Coast Guard, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-00230

EVALUATION OF TECHNIQUES FOR LONG-RANGE FORECASTING OF AIR TEMPERATURE AND ICE FORMATION,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
J. C. Rogers.
NOAA Technical Memorandum ERL GLERL-8, January 1976. 28 p, 1 fig, 6 tab, 5 ref, 6 append. Great Lakes Environmental Research Laboratory Contribution No. 60.

Descriptors: *Weather forecasting, *Air temperature, *Lake ice, *Freezing, Lakes, e, *Great Lakes, Iced lakes, Forecasting.
Identifiers: *Ice formation, *Ice forecasting, *Long-range forecasting(Ice).

Four techniques for making long-range air temperature forecasts were evaluated by using wintertime (November through February) data from around Lakes Superior, Huron, and Michigan. The purpose of the evaluation was to find a technique for forecasting air temperature which could be applied to ice forecasting on the Lakes. The four techniques analyzed were: (1) The use of cycles and oscillations: (2) The extrapolation and kinematic process used by the National Meteorological Center which results in forecasts in the Average Monthly Weather Outlook; (3) Conditional probabilities; and (4) A Markov chain equation. Based on the evaluations, it was found that only the quasi-biennial oscillation (technique 1) category forecasts and the Average Monthly Weather Outlook (technique 2) category forecasts predicted with any skill. Individually, the accuracy of the techniques is only slightly better than chance; however an improved temperature forecasting system for application to ice forecasting could be established by combining them. (NOAA)
W77-00275

LONG-RANGE FORECASTING OF MAXIMUM ICE EXTENT ON THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
J. C. Rogers.
NOAA Technical Memorandum ERL GLERL-7, January 1976. 19 p, 1 fig, 5 tab, 16 ref, 3 append. Great Lakes Environmental Research Laboratory Contribution No. 55.

Descriptors: *Great Lakes, *Ice, *Iced lakes, Lakes, *Forecasting, Weather forecasting.
Identifiers: Freezing degree-days, *Long-range forecasts(Ice).

A technique, based on prewinter thawing and wintertime freezing degree-days has been developed for making long-range forecasts of the percent maximum ice extent on the Great Lakes. The number of thawing degree-days is known by early winter, but the crux of the technique is to predict the number of freezing degree-days that will accumulate by March 3, the average date of maximum ice extent on the Lakes during the last 13 winters. This was accomplished by using an average March 3 accumulated freezing degree-day value from both the large and small ice extent winters between 1962-63 and 1968-69, which alternate in a quasi-biennial cycle. The equations and freezing degree-day prediction method were then used to hindcast maximum ice extent on the Lakes during the winters 1969-70 to 1974-75. The results indicated that the regression equation forecasting technique was more accurate than climatology forecasts for Lakes Superior, Michigan, and Huron. For Lake Ontario, climitology forecasts were equally accurate, and for Lake Erie, the small interannual variation in maximum ice extent made climatology forecasting the best technique. (NOAA)
W77-00276

FLEXURAL STRENGTH OF LAKE ICE IN RELATION TO ITS GROWTH STRUCTURE AND THERMAL HISTORY,
Cold Regions Research and Engineering Lab., Hanover, N.H. Snow and Ice Branch.
A. J. Gow, and D. Langston.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A020 964, Price codes: A03 in paper copy, A01 in microfiche. Research Report No. 349, December 1975. 33 p, 21 fig, 16 tab, 13 ref.

Descriptors: *Ice, *Lake ice, *Strength, *New Hampshire, Mechanical properties, Yield strength, Testing, On-site investigations, Lakes, Cantilevers, Temperature, Crystals, Stress, Deflection, Measurement, Strength of materials.
Identifiers: *Flexural strength, *Post Pond(NH), *Mascoma Lake(NH), Cantilever beam tests, Ice strength.

In-place cantilever beam tests on Post Pond and Mascoma Lake ice yielded a maximum flexural strength of 7.1 kg/sq cm. The minimum strength, unrelated to failure along pre-existing cracks in the ice, was 2.9 kg/sq cm. The majority of tests were performed in the push-down mode after it was discovered that beams tested in the pull-up mode, which placed the bottom surface in tension, frequently broke prematurely along cracks in the bottom of the ice. Premature failures of this kind usually occurred at stresses of 2-3 kg/sq cm. Data further demonstrated that the intrinsic strength of lake ice decreased significantly as the surface air temperature went to OC. Ice that had just become isothermal, but had not yet begun to candle, had a strength of about 4 kg/sq cm; ice that had been subjected to prolonged periods of above-freezing air temperatures generally failed at about 3 kg/sq cm. Tests also showed that cold, unrecrystallized snow-ice was as strong as the underlying lake ice. Tests of the effect of crystalline structure indicated that ice composed of crystals with their c-axes horizontal was measurably stronger than ice in which the crystals were oriented with their c-axes vertical. (Sims-ISWS)
W77-00354

EFFECT OF POROSITY ON THE HYDROSTATIC COMPRESSION OF ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H. Snow and Ice Branch.
A. J. Gow, and W. Sheehy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 302, Price codes: A02 in paper copy, A01 in microfiche. Special Report 234, October 1975. 12 p, 8 fig, 2 tab, 4 ref.

Descriptors: *Ice, *Antarctic Ocean, *Compressibility, *Laboratory tests, Physical properties, *Porosity, Cores, *Hydrostatic pressure, Analytical techniques, Testing, Testing procedures.
Identifiers: *Antarctic ice sheet, *Byrd Station, *Ice compressibility, Ice cores, Cathetometers.

A cathetometer was used in conjunction with a window-equipped pressure chamber to measure linear deformation in porous polycrystalline ice samples compressed hydrostatically at pressures of up to 0.31 kb. Tests showed that a porosity as little as 1% could increase the compressibility of ice four- or five-fold. However, the compression was of a substantially nonelastic nature, since very little recovery (expansion) occurred during and following pressure release. Pore closure, which was virtually complete at the higher pressures, could be attributed to a combination of plastic and cataclastic deformation of ice in the walls of the pores. (Sims-ISWS)
W77-00355

THE GENERATION OF RUNOFF FROM SUBARCTIC SNOWPACKS,
Washington Univ., Seattle. Dept. of Geological Sciences.
T. Dunne, A. G. Price, and S. C. Colbeck.
Water Resources Research, Vol. 12, No. 4, p 677-685, August 1976. 11 fig, 2 tab, 13 ref. CRREL, DA 4A161102B52E/02.

Descriptors: *Snowpacks, *Subarctic, *Hydrographs, *Model studies, Runoff, Generators, Snow cover, Diurnal, Waves(Water), Equations, Forecasting.
Identifiers: *Subarctic snowpacks, *Labrador, Diurnal waves, Hillside plots, Vegetative cover, Snow depth, Peak runoff.

A physically-based model of the movement of water through snowpacks was used to calculate hydrographs generated by diurnal waves of snowmelt on the tundra and in the boreal forest of subarctic Labrador. The model was tested against measured hydrographs from hillside plots that sampled a range of aspect, gradient and length, vegetative cover, and snow depth and density. The model yielded good results, particularly in the prediction of peak runoff rates, though there was a slight overestimate of the lag time. A comparison of predictions with field measurements indicated that given the ranges over which each of the controls was likely to vary, the two most critical factors controlling the hydrographs were the snow depth and the melt rate, which must be predicted precisely for short time intervals. Permeability of the snowpack was another important control, but it could be estimated closely from published values. (Roberts - ISWS)
W77-00372

ENERGY BALANCE COMPUTATIONS OF SNOWMELT IN A SUBARCTIC AREA,
Scarborough Coll., Toronto (Ontario) Div. of Social Sciences-Geography.
A. G. Price, and T. Dunne.
Water Resources Research, Vol. 12, No. 4, p 686-694, August 1976. 10 fig, 1 tab, 25 ref.

Descriptors: *Energy budget, *Snowmelt, *Subarctic, *Model studies, Tundra, Radiation, Turbulent flow, Equations, Runoff, Snow, Latent heat, Mathematical studies, Forecasting.

Identifiers: *Energy balance, Radiation heat flow, Boreal forest, Snowmelt plots, Radiative energy flux, Turbulent energy flux, Slope geometry, Sensible heat.

A physically based model was used to predict daily snowmelt on 2000-sq m plots in the subarctic. The plots had a range of aspects and inclinations under boreal forest and on the tundra. The energy balance, computed for each of the plots, was compensated for differences in radiative and turbulent energy fluxes caused by varied slope geometry and vegetative cover. The turbulent energy fluxes were also corrected for the effects of the stable stratification of the air over the snow surface. The predictions of the model were compared with daily melts derived from runoff measured on the snowmelt plots. The results showed that the method was a good predictor of daily amounts of snowmelt, although some uncertainties were introduced by changes in the snow surface during the melt period. In a companion paper, hourly snowmelt rates, calculated from the energy balance, were used to predict runoff hydrographs from hillside plots. (Roberts-ISWS)
W77-00373

SEASONAL CHANGES OF ANTARCTIC PLANKTON IN THE MOLODEZHAYA AND MIRNY REGION,
Akademiya Nauk SSSR, Leningrad. Zoologicneskii Institut.
For primary bibliographic entry see Field 5C.
W77-00397

2D. Evaporation and Transpiration

A SIMPLE METHOD FOR DETERMINING THE EVAPORATION FROM SHALLOW LAKES AND PONDS,
Atmospheric Environment Service, Downsview (Ontario).
R. B. Stewart, and W. R. Rouse.
Water Resources Research, Vol. 12, No. 4, p 623-628, August 1976. 9 fig, 13 ref.

Descriptors: *Evaporation, *Lakes, *Energy budget, *Radiation, Ponds, Equilibrium, Solar radiation, Air temperature, Models, Equations, On-site investigations, Mathematical studies.
Identifiers: *Shallow lakes, *Determining evaporation, *Hudson Bay lowlands, Summertime evaporation, Bowen ratio, Net radiation, Equilibrium model, Incoming solar radiation.

The summertime evaporation from a shallow lake in the Hudson Bay lowlands was evaluated by the energy budget (Bowen ratio) and equilibrium model approaches. Energy budget calculations revealed that, on the average, 55% of the daily net radiation was utilized in the evaporative process over the lake. Half-hourly and daily values of evaporation were approximated closely by the Priestly and Taylor (1972) model, where the ratio of actual-to-equilibrium evaporation equalled 1.26. A simple model, expressed in terms of incoming solar radiation and screen height air temperature, was developed from the comparison of actual-to-equilibrium evaporation. Tests of the model at a different location indicated that the actual evaporation could be determined within 10% over periods of two weeks. (Roberts-ISWS)
W77-00127

A NOMOGRAM TO ESTIMATE THE HEAT-EXCHANGE COEFFICIENT AT THE AIR-WATER INTERFACE AS A FUNCTION OF WIND SPEED AND TEMPERATURE; A CRITICAL SURVEY OF SOME LITERATURE,
Keuring van Electrotechnische Materialen N. V., Arnhem (Netherlands). Environmental Dept.
H. E. Sweers.
Journal of Hydrology, Vol. 30, No. 4, p 375-401, 1976. 12 fig, 6 tab, 39 ref.

Descriptors: *Heat exchangers, *Air-water-interface, Wind velocity, Water, Air temperature, Mathematical studies, Publications, Humidity, Evaporation, Energy budget, Equations.
Identifiers: *Nomograms, *Heat exchange coefficient, Wind speed, Sensible heat transfer, Evaporative heat transfer, Energy balance, Equilibrium temperature, Mass budget studies.

A nomogram was developed to relate the heat-exchange coefficient A at the air-water interface to the wind speed and to the water surface temperature. An expression for A was derived from the heat budget, giving A as a function of the so-called wind-speed function and the surface temperature. The wind-speed function was subject to frequent measurements. Part of the available literature was studied. An expression, based on the work of McMillan, was found to be applicable to conditions in temperate climates. The expression was used to construct the nomogram. (Roberts-ISWS)
W77-00130

ENERGY BALANCE COMPUTATIONS OF SNOWMELT IN A SUBARCTIC AREA,
Scarborough Coll., Toronto (Ontario). Div. of Social Sciences-Geography.
For primary bibliographic entry see Field 2C.
W77-00373

WATER RELATIONS OF GLYCYRRHIZA GLABRA L. UNDER DESERT CONDITIONS,
Cairo Univ., Giza (Egypt). Dept. of Botany; and Cairo Univ., Giza (Egypt). Faculty of Science.
For primary bibliographic entry see Field 2I.
W77-00500

EFFECT OF DEHYDRATION AND ELEVATED TEMPERATURE ON LEAF CELL THERMORESISTANCE OF A DROUGHT-SENSITIVE BARLEY CULTIVAR, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Lab. of Cytophysiology and Cytoecology.
For primary bibliographic entry see Field 2I.
W77-00503

WATER BALANCE OF STIPA PENNATA SPP. ERIOCAULIS, STIPA CAPILLATA AND FESTUCA VALLESIACE IN THE STEPPE REGION OF THE UPPER VINSCHAGAU, (IN GERMANY9,
F. Florineth.
Oecol Plant. 9(4), p 295-314, 1974.

Descriptors: *Grasslands, *Drought tolerance, Vegetation, *Grasses, Transpiration.
Identifiers: Festuca-Vallesiaca, *Italy, Steppes, Stipa-Capillata, Stipa-Pennata-Ssp-Eriocaulis, Vinschgau.

The water balance and drought resistance of S. pennata spp. eriocaulis Mart. et Skal., S. capillata L. and F. vallesiaca Schleich. was measured (in Italy) during the vegetation periods of 1971 and 1972 which differed greatly with respect to the climate. Characteristic for all 3 steppe grasses are their high transpiration values, even in dry periods. Reduction in water loss is only slightly effective, a high sublethal water saturation deficit or sufficient water uptake by a well developed root system, however, compensates for the water loss.--Copyright 1975, Biological Abstracts, Inc.
W77-00505

2E. Streamflow and Runoff

FLOAT CALIBRATION IN INTEGRATED-FLOAT TECHNIQUES,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
For primary bibliographic entry see Field 7B.
W77-00088

MORPHOLOGY OF COBBLE STREAMS IN SMALL WATERSHEDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R-M. Li, D. B. Simons, and M. A. Stevens.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY8, Proceedings Paper 12304, p 1101-1117, August 1976. 8 fig, 1 tab, 11 ref, 2 append.

Descriptors: *Small watersheds, *Streams, Geomorphology, Hydraulics, Sediments, Mathematical models, Tractive forces, Equations, Channels, Model studies, Design.
Identifiers: *Morphology, Hydraulic geometry, Stable channel design, Theoretical studies.

Stream morphology has been studied by many investigators. Most of the studies have been dependent on the statistical interpretation of observed data, and very limited theoretical work has been done to explain the mechanics of the process. As an extension of the work on stable-channel design, the basic equations describing the physical response of stream morphology were employed in this study to derive the hydraulic geometry equations of a channel in coarse alluvium. Both downstream and at-a-station relations were developed. These theoretical results agreed with the field observations. It was found that the conditions of this theoretical approach are valid in watersheds with homogeneous geology but may be valid only in small watersheds with drainage areas on the order of 10 sq miles. (Lee-ISWS)
W77-00089

FLOOD HAZARD ANALYSIS: CROOKED RIVER, TOWN OF CASCO, TOWN OF NAPLES, CUMBERLAND COUNTY, MAINE,
Soil Conservation Service, Orono, Maine.
For primary bibliographic entry see Field 4A.
W77-00100

FLOOD PLAIN INFORMATION: REPORT ON RANCOCAS CREEK, BURLINGTON COUNTY, NJ (SUMMARY REPORT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W77-00102

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 3, HYDROLOGIC FREQUENCY ANALYSIS,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A
W77-00169

CATCHMENT MODELING AND INITIAL PARAMETER ESTIMATION FOR THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM,
National Weather Service, Washington, D.C. Office of Hydrology.
For primary bibliographic entry see Field 2A.
W77-00272

APPENDIX 4, LIMNOLOGY OF LAKES AND EMBAYMENTS, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Mich. Public Information Office.
For primary bibliographic entry see Field 2H.
W77-00358

LINK SLOPE DISTRIBUTION IN CHANNEL NETWORKS,
Brock Univ., St. Catherines (Ontario). Dept. of Geological Sciences.
For primary bibliographic entry see Field 2A.
W77-00370

SIMILARITY OF THE MEAN MOTION OF FLUID PARTICLES DISPERSING IN A NATURAL CHANNEL,
Geological Survey of Canada, Ottawa(Ontario).
For primary bibliographic entry see Field 5B.
W77-00371

THE GENERATION OF RUNOFF FROM SUBARCTIC SNOWPACKS,
Washington Univ., Seattle. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2C.
W77-00372

FACTORS AFFECTING SPRING RUNOFF ON TWO FORESTED WATERSHEDS,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
M. B. Baker, Jr., and A. C. Mace, Jr.
Water Resources Bulletin, Vol. 12, No. 4, p 719-729, 7 tab, 12 ref.

Descriptors: *Runoff, *Soil water, *Minnesota, Snowmelt, Water supply, Watersheds(Basins), *Forest watersheds, Surface waters, Hydrology, Seasonal, Frost, *Recharge.
Identifiers: *Soil frost, Spring runoff, Soil water storage, Soil recharge-runoff.

The spring runoff from two forested watersheds in northern Minnesota was found to be a function of annual snowfall, soil water recharge, and water supply rates. A drainage basin with a clay soil and a hardwood overstory had greater snowmelt and water supply rates than another drainage basin with a sandy soil and conifer overstory. The average soil water recharge rate for the clay soil was 28% less than for the sandy soil. The lower recharge rate of the clay soil resulted in spring runoff which averaged 40% water supplied during the three year study while an average of 2% was produced on the sandy soil. Soil frost which affected soil water recharge varied between soil types and was influenced by amount of soil water storage and snow cover. (Lee-ISWS)
W77-00374

ENVIRONMENTAL IMPACT OF STREAM CHANNELIZATION,
Baker (Michael), Jr., Inc., Beaver, Pa.
For primary bibliographic entry see Field 6G.
W77-00375

SOME DIFFERENCES BETWEEN DISTRIBUTING AND BRAIDING CHANNELS,
Macquarie Univ., North Ryde (Australia). School of Earth Sciences.
S. J. Riley.
Journal of Hydrology (New Zealand), Vol. 14, No. 1, p 1-8, 1975.

Descriptors: *Distribution, *Braiding, *Channels, *Channel morphology, Rivers, Streams, Surface drainage, Streamflow, Erosion, Sedimentation, Deltas, Bed load.
Identifiers: *Distributing channels, *Braiding channels, *New Zealand, *Namoi-Gwydir distributing system.

The individual channels of a distributary system develop floodplains that are independent of the parent streams, whereas the channels of a braided system do not develop separate floodplains. With respect to sediment load, bank cohesion, discharge, and slope, the Namoi-Gwydir distributary system does not resemble braided systems. The channel patterns of braiding and distributing are sometimes equated and related to similar fluvial processes. This paper proposed a morphological definition for distributaries that will distinguish them from braided streams. Several arguments were presented which suggest that braided and distributary channels are distinctly different with respect to causative fluvial factors. (Sims-ISWS)
W77-00376

HYDROLOGIC UNIT MAP--1974, STATE OF IOWA
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-00425

MEAN ANNUAL RUNOFF IN THE UPPER OHIO RIVER BASIN, 1941-70, AND ITS HISTORIC VARIATION,
Geological Survey, Harrisburg, Pa.
R. M. Beall.
Open-file report 76-384, May 1976. 41 p, 6 fig, 4 tab, 8 ref.

Descriptors: *Streamflow, *Average flow, *Flow characteristics, *Ohio River, *River basins, Runoff, Gaging stations, Maps, Flow rates, Annual, Hydrologic data.
Identifiers: *Upper Ohio River basin, 1941-70 mean annual runoff.

A map of the Ohio River basin above the Muskingum River shows patterns of mean annual runoff for the climatologic and hydrologic reference period, 1941-70. The primary data base consisted of 98 long-term gaging-station records collected within this 27,300-square-mile headwater area of the Ohio River basin. Supplemental information was derived from 83 short-term records. Mean annual runoff is at a regional minimum of less than 12 inches in an area extending from the northern West Virginia panhandle to the headwaters of the Mahoning River in Ohio. Mean annual runoff of more than 32 inches occurs in parts of the upper Cheat River basin in West Virginia. The zone of high runoff trends northeastward along the western slopes of the Allegheny Mountains; magnitudes diminish to about 25 inches at the eastern basin boundary near Ebensburg, Pennsylvania. Runoff of this magnitude occurs also in a band across the upper Allegheny River basin in Pennsylvania. Ratios of mean annual discharge to the 30-year reference-period average were computed for each year of record for all long-term gaging stations. Annual discharges have ranged from about 30 percent to 200 percent of the 30-year mean. Graphed summaries of the annual ratios document the relative duration and magnitude of wet and dry periods during the past 65 years in the upper Ohio River basin. (Woodard-USGS)
W77-00428

HYDROLOGIC UNIT MAP--1974, STATE OF WYOMING.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-00429

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 4. ST. LAWRENCE RIVER BASIN--VOLUME 2. ST. LAWRENCE RIVER BASIN BELOW LAKE HURON.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W77-00431

DEVELOPMENT OF A STANDARD RATING FOR THE PRICE PYGMY CURRENT METER,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7B.
W77-00432

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1975,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2J.
W77-00433

FLOODS OF MARCH-APRIL 1973 IN SOUTHEASTERN UNITED STATES,
Geological Survey, Reston, Va.
G. W. Edelen, Jr, and J. F. Miller.
Available from Supt. of Documents, GPO, Wash., D.C., 20402, $4.50. Professional Paper 998, 1976. 283 p, 19fig, 10 tab, 11 ref.

Descriptors: *Floods, *Southeast U.S., *Flood data, *Streamflow, *Peak discharge, Rainfall-runoff relationships, Gaging stations, Flood damage, Flood recurrence interval, Reservoirs, Hydrologic data.

Floods during March-April 1973 were the greatest of record on many streams in nine major river basins in seven Southeastern States. The major thrust of the flood extended throughout the central part of the Tennessee River basin and into adjacent basins. Recurrence intervals of peak discharges exceeded 100 years at 28 streamflow gaging stations. Major flooding occurred both on streams with flood-control reservoirs and on those which had none. Substantial reductions in peak stages and discharges in the Cumberland and Tennessee River basins were attained as a result of reservoir storage regulation. Seven lives were lost and total damage reportedly exceeded $60 million. The report presents an analysis of the storm and rainfall distribution; summaries of flood stages and discharges at 490 streamflow gaging stations, stages and contents of 45 reservoirs, flood crest stages, and hydrograph data consisting of gage height, discharge, and accumulated runoff at selected times at 92 gaging stations. The availability of aerial photographs obtained during the flood is summarized and flood damages are discussed. (Woodard-USGS)
W77-00434

ESTIMATION AND SIMULATION OF SHEET RUNOFF,
Commonwealth Scientific and Industrial Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 4A.
W77-00439

MAGNITUDE AND FREQUENCY OF FLOODS IN NORTH CAROLINA: TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS ON NATURAL STREAMS IN NORTH CAROLINA,
Geological Survey, Raleigh, N. C.
N. M. Jackson, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254-411, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-17, March 1976. 26 p, 8 fig, 2 tab, 19 ref.

Descriptors: *Floods, *Flood frequency, *Frequency analysis, *Regression analysis, *North Carolina, Streams, River basins, Natural streams, Gaging stations, Regional analysis, *Streamflow forecasting, Equations, Maximum probable flood, Drainage area.
Identifiers: *Ungaged streams.

Methods are provided to estimate the magnitude and frequency of floods on natural North Carolina streams with drainage areas greater than 0.5 square mile (1.3 square kilometers). For 257 gaged sites, the magnitudes of floods having recurrence intervals from 2 to 100 years are provided in tables. For ungaged sites, equations, graphs, and maps allow estimation of flood magnitudes. Multiple regression techniques were used to define the relation between flood peaks and seven basin and climatic variables. Drainage area is the most significant variable. Inclusion of the other six variables reduced the standard error of estimate less than 4 percent. Regression equations gave consistently different results for stations in the Coastal Plain than for stations in the mountains and Piedmont. Accordingly, stations were divided into two groups and estimating equations were developed for each geographic area. (Woodard-USGS)
W77-00480

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON FISHKILL CREEK, FISHKILL, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4C.
W77-00483

MAXIMUM KNOWN STAGES AND DISCHARGES OF NEW YORK STREAMS THROUGH 1973,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 7C.
W77-00485

LAKES MARION-MOULTRIE STREAM SYSTEM INVESTIGATION: PART II-SIMULATION STUDIES,
Geological Survey, Columbia, S.C.
For primary bibliographic entry see Field 4A.
W77-00488

2F. Groundwater

CHEMICAL WEATHERING OF GLAUCONITE,
Tripoli Univ., Libya. Dept. of Soil and Water Sciences.
For primary bibliographic entry see Field 2K.
W77-00289

THE ACTIVITY CONCEPT OF PHOSPHATE-ROCK SOLUBILITY,
International Fertilizer Development Center, Florence, Ala.
For primary bibliographic entry see Field 2K.
W77-00290

THE MECHANISM OF PHOSPHATE FIXATION BY IRON OXIDES,
Griffith Univ., Nathan, (Australia).
For primary bibliographic entry see Field 2K.
W77-00291

GEOLOGIC NITROGEN IN PLEISTOCENE LOESS IN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-00366

TOWARDS A COMPUTER-BASED INFORMATION-RETRIEVAL SYSTEM FOR GROUNDWATER DATA,
New Zealand Geological Survey, Christchurch.
For primary bibliographic entry see Field 7C.
W77-00377

HYDROGEOLOGIC DATA FROM THE GREAT BEND PRAIRIE, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W77-00426

GROUND-WATER LEVELS IN THE UNITED STATES, 1970-74: SOUTH-CENTRAL STATES.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W77-00430

EFFECTS OF NEAR-WELL PERMEABILITY VARIATION ON WELL PERFORMANCE,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 4B.
W77-00437

DRILLING MUD INVASION OF UNCONSOLIDATED AQUIFER MATERIALS,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 8B.
W77-00438

GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1975,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W77-00479

DIGITAL SIMULATION OF A BASALT AQUIFER SYSTEM, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4B.
W77-00481

DIGITAL-MODEL ANALYSIS TO PREDICT WATER LEVELS IN A WELL FIELD NEAR COLUMBUS, INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 4B.
W77-00482

GROUND-WATER DATA FOR ATTALA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W77-00484

CHANGES IN THE WATER SUPPLY IN THE UPPER REPUBLICAN NATURAL RESOURCES DISTRICT, SOUTHWEST NEBRASKA, FROM 1952-75,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4B.
W77-00489

ONE-DIMENSIONAL SIMULATION OF AQUIFER SYSTEM COMPACTION NEAR PIXLEY, CALIFORNIA: 2. STRESS-DEPENDENT PARAMETERS,
Geological Survey, Menlo Park, Calif.
D. C. Helm.
Water Resources Research, Vol 12, No 3, p 375-391, June 1976. 12 fig, 1 tab, 22 ref.

Descriptors: *Land subsidence, *Model studies, *Aquifer systems, *California, Methodology, Aquitards, Hydraulic conductivity, Specific retention, Water storage, Compaction, Aquifer characteristics, *Simulation analysis, Computer models.

A major problem facing hydrologists is how to predict land subsidence. A key to this problem is the development of a reliable method for evaluating aquitard parameters. For assumed values of hydraulic conductivity and storage, vertical compaction and expansion of idealized aquitards can be computed (predicted) by an appropriate diffusion equation from known (projected) water level changes in adjacent aquifers. If water levels within the aquifers are observed and the resulting field compaction and expansion are measured, the parameters themselves can be evaluated. Such field measurements are available at a site near Pixley, California, for the composite behavior of a series of 21 doubly draining aquitards. By means of a linear partial differential equation with constant coefficients within one digital model, average hydraulic conductivity for idealized aquitards was evaluated from the field data to be 3000 ft/yr, and average nonrecoverable specific storage was evaluated to be 0.00023 ft. A second model allows parameters of nonrecoverable compaction to be stress sependent by assuming for any single material that the product of hydraulic conductivity and an incremental effective stress is a constant and that the product of nonrecoverable specific storage and past maximum effective stress is a constant. (See also W75-08826) (Woodard-USGS)
W77-00490

2G. Water In Soils

ENVIRONMENTAL IMPACT OF CADMIUM AND OTHER HEAVY METALS FROM LAND-APPLIED SEWAGE SLUDGE,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W77-00002

MODELING INFILTRATION AND REDISTRIBUTION OF SOIL WATER DURING INTERMITTENT APPLICATION,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
L. G. James, and C. L. Larson.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 482-488, May-June 1976. 7 fig, 4 tab, 22 ref.

Descriptors: *Infiltration, *Infiltration rates, *Soil physics, *Unsaturated flow, *Soil water movement, *Unsteady flow, Soils, Porous media, Equations, Soil properties, Mathematical models, Laboratory tests, Computers.

A model that used relatively simple and reasonably accurately measured parameter equations was used to represent infiltration and redistribution of soil water during intermittent water applications. Application of the model was limited to short time periods since evapotranspiration was neglected and only impervious and air-soil interface type lower boundaries to the soil zone were considered. The soil was required to be homogeneous and to have distinct wetting fronts. Laboratory data were collected and compared with the model predictions. The model was found to predict satisfactorily the runoff quantities and timing, the volume of water stored in the soil, and the soil moisture profiles including the position of the wetting front. The model over-predicted the infiltration rate when the application rate exceeded the infiltration capacity of the soil. (Adams-ISWS)
W77-00093

DISPOSITION OF FERTILIZER NITRATE APPLIED TO A SWELLING CLAY SOIL IN THE FIELD,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 5B.
W77-00144

PORE VOLUME DISTRIBUTION AND CURVE OF WATER CONTENT VERSUS SUCTION OF POROUS BODY: 2. THE BOUNDARY WETTING CURVE,
Tokyo Univ. (Japan).
M. Nakano.
Soil Science, Vol. 122, No. 2, p 100-106, August 1976. 9 fig, 1 tab, 9 ref.

Descriptors: *Porosity, *Moisture content, *Wetting, *Statistical models, Probability, Negative pore pressure, Curves, Drying, Boundaries(Surfaces), Saturation, Hysteresis, Porous media, Theoretical analysis, Surface tension, Sands, Laboratory tests, Distribution.
Identifiers: Air entrapment, Density function, O-type pore, X-type pore.

The boundary wetting curve of water content versus suction was derived by using the effective pore volume distribution which is obtained by combination of probability theory with a pore model that was proposed in a previous report (Nakano 1976). The theoretical curve was compared to experimen-

tal data with good agreement for three samples. But, when the theoretical boundary wetting curve was drawn by using the same values of parameters lambda, nu, and alpha as those applied to the boundary drying curve, a function which supplemented the relationship between suction and pore radius had to be used. This function was decided by measurement and was shown in the report. (Visocky-ISWS)
W77-00162

CATCHMENT MODELING AND INITIAL PARAMETER ESTIMATION FOR THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM,
National Weather Service, Washington, D.C. Office of Hydrology.
For primary bibliographic entry see Field 2A.
W77-00272

RETENTION OF ARSENIC BY HYDROXY-ALUMINUM ON SURFACES OF MICACEOUS MINERAL COLLOIDS,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-00283

SPATIAL VARIABILITY IN SOILS BELOW DEPTH OF TILLAGE: BULK DENSITY AND FIFTEEN ATMOSPHERE PERCENTAGE,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
D. K. Cassel, and A. Bauer.
Soil Science Society of America, Vol. 39, No. 1, p 247-250, March-April, 1975. 5 fig, 3 tab, 5 ref.

Descriptors: *Spatial distribution, *Soil investigations, Soil properties, Soil texture, Bulk density, Soil water, Soil pressure, Clays, Loam.
Identifiers: Tillage depth.

Soil bulk density (D) and the 15-atm percentage (FAP) were measured for three soils--Maddock sandy loam, Bearden silty clay, both of glaciolacustrine origin, and Heimdal silt loam of glacial origin. D and FAP were measured in approximately 30-cm increments from a depth of 30 to 152 cm. (Skogerboe-Colo St)
W77-00284

A PROCEDURE FOR THE SAMPLING AND TESTING OF LARGE SOIL CORES,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
K. K. Watson, and S. J. Lees.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 589-590, May-June 1975. 1 fig, 6 ref.

Descriptors: *Soil water, *Computer models, Soil properties, Soil investigations, Soil moisture, Soil tests, *Laboratory tests, *Sampling, Soil analysis.
Identifiers: *Soil cores.

The significance of acquiring reliable data on the soil-water characteristics of field soils is discussed in relation to the input requirements of computer-based numerical models of the unsaturated flow process. A specification outlining the conditions to be fulfilled in sampling and testing a large soil core is then detailed. Equipment used in extracting a 40-cm-diam soil core is described together with relevant laboratory instrumentation. (Skogerboe-Colo St)
W77-00286

SOIL BULK DENSITIES AFTER THIRTY YEARS UNDER DIFFERENT MANAGEMENT REGIMES,
Grand Valley State Coll., Allendale, Mich. Dept. of Environmemtal Science.
M. L. Northup, and J. R. Boyle.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 588, May-June 1975. 1 tab.

Descriptors: *Soil density, *Bulk density, *Nutrients, *Cultivation, Soil properties, Soil investigations, Soils, Soil compaction, Vegetation.

Variability of soil bulk density must be known to convert accurately concentrations of nutrients in a soil to absolute quantities. This study shows that cultivation increases the bulk density of some soils and simultaneously lowers its variability. Establishment of prairie and pine vegetation on cultivated soils has not created significant differences in this property between vegetation types in 30 years. (Skogerboe-Colo St)
W77-00287

TWO-DIMENSIONAL SOLUTES TRANSFER DURING NONSTEADY INFILTRATION: LABORATORY TEST OF MATHEMATICAL MODEL,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept of Agronomy.
E. Bresler, and D. Russo.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 585-587, May-June 1975. 3 fig, 3 ref.

Descriptors: *Solutes, *Infiltration, Irrigation, Irrigation effects, Irrigation practices, Soil water movement, *Mathematical models, *Laboratory tests.
Identifiers: *Trickle irrigation, *Drip irrigation, *Solute transport.

The theory of two-dimensional transport of solutes during nonsteady infiltration from trickle sources, as developed previously, was compared with experimental results. A laboratory experiment was conducted under conditions similar to those assumed in the two-dimensional plane flow model. The agreement between theory and experiment as expressed by salt concentration distribution and location of wetting fronts, is generally good. This suggests that the theory is applicable to many situations similar to the conditions studied. (Skogerboe-Colo St)
W77-00288

CHEMICAL WEATHERING OF GLAUCONITE,
Tripoli Univ., Libya. Dept. of Soil and Water Sciences.
For primary bibliographic entry see Field 2K.
W77-00289

THE ACTIVITY CONCEPT OF PHOSPHATE-ROCK SOLUBILITY,
International Fertilizer Development Center, Florence, Ala.
For primary bibliographic entry see Field 2K.
W77-00290

THE MECHANISM OF PHOSPHATE FIXATION BY IRON OXIDES,
Griffith Univ., Nathan, (Australia).
For primary bibliographic entry see Field 2K.
W77-00291

VARIATIONS IN THE NATURAL ABUNDANCE OF N OF WHEAT PLANTS IN RELATION TO FERTILIZER NITROGEN APPLICATIONS,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 3F.
W77-00292

EFFECT OF ANION EXCLUSION ON THE MOVEMENT OF CHLORIDE THROUGH SOILS,
Chile Univ., Santiago. Facultad de Ciencias Quimicas.
For primary bibliographic entry see Field 5B.
W77-00293

DENITRIFICATION RATES IN RELATION TO TOTAL AND EXTRACTABLE SOIL CARBON,
Agricultural Research Service, Beltsville, Md.
G. Stanford, R. A. Vander Pol, and S. Dzienia.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 284-289, March-April 1975. 2 fig, 5 tab, 16 ref.

Descriptors: *Denitrification, *Soil investigations, *Soil chemistry, *Soil chemical properties, *Carbon.
Identifiers: *Soil carbon, Nitrate-nitrogen.

Denitrification rates were studied under near-anaerobic conditions in 30 soils of diverse origin that differed widely in pH, organic C contents, and other characteristics. Soils with added NO3-N were submerged in water and containers were sealed to prevent further oxygen intake during incubation. Disappearance of NO3-N and production of NH4-N were determined at 1-day intervals or longer over a 10-day period. Since soils were not shaken during incubation, denitrification rates were influenced by diffusion of nitrate from the liquid to the soil layer. In most soils, amounts of NO3-N declined exponentially with time of incubation. Thus, under the experimental conditions, the loss of nitrate was depicted better by log NO3-N vs. time (t, hours) than ppm NO3-N vs. t. (Skogerboe-Colo St)
W77-00294

SORPTION OF SULFUR DIOXIDE BY CALCAREOUS SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W77-00295

SODIUM AVAILABILITY IN NONALKALI SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
A. Suarez-Hernandez, and J. J. Hanway.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 308-311, March-April 1975. 2 fig, 2 tab, 17 ref.

Descriptors: *Sodium, *Soil investigations, *Soil chemistry, *Soil chemical properties, Soil management, *Iowa.
Identifiers: Exchangeable sodium, *Ryegrass.

Ryegrass was grown in the greenhouse on undried soil samples from the 0 to 15 and 30 to 45 cm depths of 15 Iowa soils. The NH40Ac exchangeable Na was 21 ppm or less in all soil samples except those from the 30 to 45 cm depth in southern Iowa soils, which contained 28 to 115 ppm exchangeable Na. The pH of these southern Iowa subsurface samples varied from 5.1 to 6.0. Percentages of Na in the first harvest of ryegrass were directly related to the exchangeable Na contents of the soils and inversely related to exchangeable soil K and K content of the plants. (Skogerboe-Colo St)
W77-00296

TOTAL NITROGEN USING A SODIUM HYDROXIDE INDEX AND DOUBLE SAMPLING THEORY,
Forest Service (USDA), La Grande, Oreg. Pacific Northwest Forest and Range Experiment Station.
J. M. Geist, and J. W. Hazard.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 340-343,March-April 1975. 1 fig, 1 tab, 4 ref.

Descriptors: *Nitrogen, *Regression analysis, Soil chemistry, Soil properties, Soil investigations, Soil tests.
Identifiers: *Sodium hydroxide index, *Double sampling theory.

A regression relationship was investigated between total Kjeldahl soil N and an NaOH distil-

lable fraction of soil N. The correlation coefficient r was 0.989 for 45 soil samples. A double sampling approach using both analyses to estimate total N was more efficient than Kjeldahl analyses only. Example applications are presented under cost and precision limitations. The regression can also be used to obtain point values of total N for mapping or other nonstatistical purposes. (Skogerboe-Colo St)
W77-00297

RELATIONSHIPS BETWEEN SORPTION AND DESORPTION OF PHOSPHORUS BY SOILS,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
For primary bibliographic entry see Field 5B.
W77-00298

A NEW TECHNIQUE FOR RAPID AND CONTINUOUS MEASUREMENT OF REDOX POTENTIALS,
Lockheed Missiles and Space Co., Sunnyvale, Calif.
R. S. Linebarger, F. D. Whisler, and J. C. Lance.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 375-377, March-April, 1975. 2 fig, 2 ref.

Descriptors: *Laboratory tests, *Electrodes, Soil tests, Sewage, Sewage disposal, *Oxidation reduction potential, Measurement, Analytical techniques.
Identifiers: Soil columns.

A new 'salt bridge' technique for the rapid and continuous measurement of redox potentials at various depths in multiple soil columns, utilizing only one calomel electrode, is described. The method was compared with a previous technique where a reference electrode was placed in each of 8 soil columns, containing a total of 42 platinum redox probes. A least-squares best fit statistical analysis indicated that the new technique yields redox potential measurements accurate as those of the previous method. Several other features of the salt bridge technique make it advantageous for use both in the laboratory and in the field. (Skogerboe-Colo St)
W77-00299

USE OF AMMONIA ELECTRODE FOR DETERMINATION OF CATION EXCHANGE CAPACITY IN SOIL STUDIES,
Iowa State Univ., Ames. Dept. of Soil Science.
G. A. Miller, F. F. Riecken, and N. F. Walter.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 372-373, March-April 1975. 1 fig, 7 ref.

Descriptors: *Cation exchange, Soil tests, Soil properties, Soil investigations, Laboratory tests, Electrodes, Analytical techniques, *Soil profiles, Ion exchange.
Identifiers: Ammonia electrode.

Cation exchange capacity (CEC) was determined with an ammonia electrode on 37 horizon samples from four soil profiles. The profiles selected to test this procedure had a wide range of physical and chemical properties. The procedure was a modification of other techniques. Centrifugation was employed for removal of exchangeable cations and ammonium salts. The CEC values obtained with the ammonia electrode agreed closely with values obtained by direct distillation for adsorbed ammonia. The method was simple and rapid and suitable for soil studies. Using the proposed method a single operator could carry out the analysis of 16 or more samples in a normal working day. (Skogerboe-Colo St)
W77-00300

GRAPHICAL REPRESENTATION OF TRICATIONIC EXCHANGES WHERE ONE OF THE CATIONS IS THE PROTON,
Centre de Recherches Agronomiques de Provence, Antibes (France). Station d'Agronomie et de Physiologie Vegetale.
J. P. Andre.
Journal of Soil Science, Vol. 26, No. 1, p 81-92, March 1975. 5 fig, 16 equ, 1 ref.

Descriptors: *Model studies, *Cation exchange, Soils, Soil investigations, Adsorption, Agronomy, Physiology.
Identifiers: Protons(Cation exchange).

Most constituents of the adsorbing complex of the soil are cationic exchangers with variable exchange capacity: it is possible to study graphically exchanges involving the protons and two other cations. The representation developed here uses and generalizes the principle of the bicationic exchange isotherms in a square diagram. This helps to explain some experimental phenomena and enables the final equilibria of the exchange reactions to be forecast. The model seems useful for application in agronomy and physiology. (Skogerboe-Colo St)
W77-00304

EFFECT OF PLOUGHING AND DIRECT DRILLING ON SOIL NITRATE CONTENT,
Agricultural Research Council, Wantage (England). Letcombe Lab.
R. J. Dowdell, and R. Q. Cannell.
Journal of Soil Science, Vol. 26, No. 1, p 53-61, March 1975. 2 fig, 2 tab, 26 ref.

Descriptors: *Nitrates, *Cultivation, Soils, Soil investigations, Water quality, Clays.
Identifiers: *Soil nitrates, *Cultivation practices, *Direct drilling(Crops), *Nitrate-nitrogen.

The concentration of nitrate-N at 30 cm depth in a clay soil was 2-5 times greater after ploughing than after direct drilling during the winter and spring of 1972-73. However, by early May no significant differences could be detected between cultivation treatments. It is concluded that decreased mineralization of soil nitrogen in the direct-drilled soil is the main factor responsible for the differences observed. (Skogerboe-Colo St)
W77-00305

EFFECT OF ALTERNATE AEROBIC AND ANAEROBIC CONDITIONS ON REDOX POTENTIAL, ORGANIC MATTER DECOMPOSITION AND NITROGEN LOSS IN A FLOODED SOIL,
Louisiana State Univ., Baton Rouge. Lab. of Flooded Soils and Sediments.
For primary bibliographic entry see Field 5B.
W77-00306

TEMPERATURE EFFECTS ON AMMONIFICATION AND NITRIFICATION IN A TROPICAL SOIL,
Commonwealth Scientific and Industrial Organization, Canberra (Australia). Div. of Land Use Research.
R. J. K. Myers.
Soil Biology and Biochemistry, Vol. 7, No. 2, p 83-86, March 1975. 2 fig, 2 tab, 14 ref.

Descriptors: *Ammonification, *Nitrification, Soils, Soil investigations, *Nitrogen, Temperature, Loans, *Australia.
Identifiers: *Tropical soils, Organic nitrogen, *Ammonium-nitrogen, Tippera clay loam.

Ammonification of soil organic N and nitrification of ammonium-N was studied in Tindall clay loam over a range of temperatures from 20-60 C. Nitrification rates at each temperature were constant throughout the 28 day incubation, whereas most of the ammonification occurred in the first 7 days. (Skogerboe-Colo SU)
W77-00307

FORMATION OF CHEMICAL AND BIOLOGICAL DENITRIFICATION PRODUCTS IN FLOODED SOIL AT CONTROLLED PH AND REDOX POTENTIAL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
O. Van Cleemput, W. H. Patrick, Jr., and R. C. McIlhenny.
Soil Biology and Biochemistry, Vol. 7, No. 4/5, p 329-332, July 1975. 3 fig, 1 tab, 13 ref.

Descriptors: *Denitrification, *Saturated soils, Soils, Soil investigations, Chemical reactions, *Hydrogen ion concentration, *Oxidation-reduction potential, Flooding, Saturated soils.

The formation of denitrification products was studied in a waterlogged soil which was treated with and without mercuric chloride. Before the addition of the sterilant and NO3-N the pH was controlled at 4.5, 6 and 8 and the redox potential at 0 and +400 mV in stirred suspensions. Denitrification products N2, N20 and some traces of NO were detected. (Skogerboe-Colo SU)
W77-00308

SHORT TERM NITRATE LOSSES AND ASSOCIATED MICROBIAL POPULATIONS IN SOIL COLUMNS,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
H. E. Doner, M. G. Volz, L. W. Belser, and Jan-Per Loken.
Soil Biology and Biochemistry, Vol. 7, No. 4/5, p 261-263, July 1975. 1 fig, 15 ref.

Descriptors: *Nitrates, *Leaching, Soil investigations, Soils, Soil tests, Return flow, Irrigation, Microbiology, Nitrogen.
Identifiers: *Soil columns, *Microbial populations(Soils).

The relationship between N03 loss from solution and associated microbial populations as a function of time and depth in soil was studied. Soil columns were leached with a N03 solution under flooded conditions. Soil columns were cut into top, middle and bottom sections following 4.5, 12, 24, 48 and 120 h of leaching. Soil was subsequently analyzed for N03 and N02 content and microbial counts were made for denitrifiers, nitrate reducers and total microbial population. Nitrate losses were found to be directly related to an increase in the denitrifier population and proportional to the residence time of solution in the soil. The total microbial population and nitrate reducer population remained nearly constant throughout the experiment. (Skogerboe-Colo SU)
W77-00309

SOIL ORGANIC MATTER FRACTIONS AS SOURCES OF PLANT AVAILABLE SULPHUR,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. R. Freney, G. E. Melville, and C. H. Williams.
Soil Biology and Biochemistry, Vol. 7, No. 3, p 217-221, May 1975. 1 fig, 5 tab, 21 ref.

Descriptors: *Organic matter, *Sulphur, Soils, Soil investigations, Soil-water-plant relationships.
Identifiers: Soil organic matter.

Pot culture experiments are described which attempt to identify the organic fractions of soil sulphur that decompose during the growing season to provide plant-available sulphur. Soil organic matter was labelled with 35S by incubating soil with labelled sulphate and several organic sulphur fractions were determined before and after the growth of Sorghum vulgare and following a fallow treatment. The effect of moisture stress on the uptake of sulphur by plants was also investigated;

this treatment had little effect. (Skogerboe-Colo St)
W77-00310

RELATIONSHIPS BETWEEN THE DENITRIFICATION CAPACITIES OF SOILS AND TOTAL, WATER-SOLUBLE AND READILY DECOMPOSABLE SOIL ORGANIC MATTER,
Iowa State Univ., Ames. Dept. of Agronomy.
J. R. Burford, and J. M. Bremner.
Soil Biology and Biochemistry, Vol. 7, No. 6, p 389-394, November 1975. 5 fig, 3 tab, 13 ref.

Descriptors: Organic matter, *Denitrification, Soils, Soil investigation, Soil chemistry, *Nitrogen, Anaerobic conditions, *Decomposing organic matter, Carbon.
Identifiers: Organic carbon.

The relationships between the denitrification capacities of 17 surface soils and the amounts of total organic carbon, mineralizable carbon, and water-soluble organic carbon in these soils were investigated. The soils differed markedly in pH, texture, and organic-matter content. Denitrification capacity was assessed by determining the N evolved as N2 and N20 on anaerobic incubation of nitrate-treated soil at 20 degrees C for 7 days, and mineralizable carbon was assessed by determining the C evolved as C02 on aerobic incubation of soil at 20 degrees C for 7 days. The denitrification capacities of the soils studied were significantly correlated with total organic carbon and very highly correlated with water-soluble organic carbon or mineralizable carbon. The amount of nitrate N lost on anaerobic incubation of nitrate-treated soils for 7 days was very closely related to the amount of N evolved as N2 and N20. (Skogerboe-Colo St)
W77-00311

PERFORMANCE AND EVALUATION OF COMBINED MOLE-TILE DRAIN SYSTEM IN HEAVY SOILS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 4A.
W77-00316

AN EXPERIMENTAL BURIED MULTISET IRRIGATION SYSTEM,
Agricultural Research Service, Kimberly Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 3F.
W77-00317

NITROGEN IN SOIL CORES AND GROUND WATER UNDER ABANDONED CATTLE FEEDLOTS,
Agricultural Research Service, Lincoln, Nebr. Animal Waste Management Research Unit.
For primary bibliographic entry see Field 5B.
W77-00365

MAPPING RUNOFF-PRODUCING ZONES IN HUMID REGIONS,
McGill Univ., Montreal (Quebec). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W77-00368

FACTORS AFFECTING SPRING RUNOFF ON TWO FORESTED WATERSHEDS,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2E.
W77-00374

TRANSPORT OF CARBON14-ASSIMILATES IN THE SUGAR BEET UNDER DIFFERENT CONDITIONS OF NUTRITION AND MOISTURE, (IN RUSSIAN),
Kirgiz State Univ., Frunze (USSR).
For primary bibliographic entry see Field 5B.
W77-00421

ESTIMATION AND SIMULATION OF SHEET RUNOFF,
Commonwealth Scientific and Industrial Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 4A.
W77-00439

THE EFFECT OF BULK DENSITY ON NEUTRON METER CALIBRATION,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond, (Australia). Div. of Soils.
E. L. Greacen, and G. Schrale.
Australian Journal of Soil Research, Vol 14, No 2, p 159-169, June 1976. 2 fig, 4 tab, 10 ref.

Descriptors: *Nuclear moisture meters, *Calibrations, *Soil density, Soil moisture, Moisture content, Instrumentation, Measurement, Neutron absorption, Soil physical properties.

In the use of neutron moisture meters sufficient account is not always taken of the need for careful calibration, particularly with respect to variations in soil dry bulk density. Experimental and theoretical methods have been proposed for obtaining correction factors but for various reasons they are not satisfactory. Olgaards method based on three group diffusion theory gives acceptable accuracy for soils with small absorption cross-section, but for soils with high absorption cross-section, common in Australia, this model fails to predict the slope of the calibration line. A simpler alternative procedure is proposed, based on the assumption that count rate at constant total water content is proportional to the square root of bulk density. (CSIRO)
W77-00440

HYDRAULIC CONDUCTIVITY IN SURFACE ACTIVE SOILS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak, and M. R. Madhav.
Australian Journal of Soil Research, Vol. 14, No. 2, p 121-127, June 1976. 4 fig., 16 ref.

Descriptors: *Clays, *Hydraulic conductivity, *Pore water, *Water structure, *Viscosity, *Bound water, Capillary water, Capillary flow, Soil water movement, Soil physical properties, Equations, Mathematical studies.

Kozeny's equation based on a capillary tube model with constant viscosity does not give satisfactory results for fine-grained soils. When surface forces dominate over gravity forces, the pore water behaves abnormally and the physical properties of this pore water are found to be quite different from free water. Flow through saturated fine-grained soils is known to be affected by the properties and thickness of loosely and strongly bound water, whose viscosity is observed to be higher because of the modified water structure induced by clay-water interaction. An analytical solution based on a capillary-tube model taking into account the changed viscosity of bound water and variation of viscosity within the bound water in relation to its thickness is attempted. The derived equation appears to be general in nature and is applicable for both surface active and inactive soils. It is shown that Kozeny's equation turns out to be a particular case of the derived equation when the thickness of the bound water is zero or when the variation of viscosity is not taken into account. (CSIRO)
W77-00441

A WATER BALANCE MODEL AND SUPPLY INDEX FOR WHEAT IN SOUTH AUSTRALIA,
Commonwealth Scientific and Industrial Research Ogrganization, Adelaide (Australia). Div. of Soils.
For primary bibliographic entry see Field 3F.
W77-00444

THE EFFECT OF SOIL PROPERTIES ON ZINC ADSORPTION BY SOILS,
Georgia Univ., Experiment. Dept. of Agronomy.
L. M. Shuman.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 454-458 May-June, 1975. 4 fig, 2 tab, 18 ref.

Descriptors: *Zinc, *Organic matter, *Clays, Soils, *Soil investigations, *Sands, Soil chemistry, Soil texture, *Adsorption, Georgia, Hydrogen ion concentration, Organic matter, Isotherms, Cation exchange, Path of pollutants.
Identifiers: Langmuir isotherm, *Cation exchange capacity.

Solutions containing eight different concentrations of Zn were equilibrated with four soils sampled at two depths to determine whether Zn adsorption conformed to the Langmuir isotherm and to relate the Langmuir coefficients to soil properties. Zinc adsorption conformed to the Langmuir isotherm and two linear portions of the curve were found. The adsorption sites for the lower part had very high bonding energy coefficients and low adsorptive capacities compared with the adsorption sites of the part of the curve corresponding to higher Zn concentrations in the equilibrating solution. The cation exchange capacity (CEC) was related to the adsorptive capacity. The lower part was equivalent to 23% of the CEC and the upper part to 76% of the CEC. Soils high in clay or organic matter had higher adsorptive capacities and higher bonding energies for Zn than sandy soils low in organic matter. More differences in Zn adsorption were observed among soil types than between depths in each soil type. A study of the effect of pH on the adsorption of Zn revealed that low pH reduced Zn adsorption more for the sandy soils than for those high in colloidal-size materials. (Skogerboe-Colo St)
W77-00469

INTERACTIONS BETWEEN ORGANIC COMPOUNDS, MINERALS, AND IONS IN VOLCANIC ASH DERIVED SOILS: I. ADSORPTION OF BENZOATE, P-OH BENZOATE, SALICYLATE, AND PHTHALATE IONS,
California Univ., Riverside. Dept. of Soil Science.
H. Appelt, N. T. Coleman, and P. F. Pratt.
Soil Science Society of America Proceedings, Vol. 39, No. 4, p 623-627, July-August 1975. 4 fig, 4 tab, 15 ref.

Descriptors: *Ions, *Organic compounds, *Adsorption, Soils, *Soil investigations, Path of pollutants, South America, Soil analysis.
Identifiers: *Desorption, *Minerals, Benzoate ions, Salicylate ions, Phthalate ions, *Chile, *Typic Dystrandept soils, *Volcanic-ash soils.

The adsorption, desorption, and competitive adsorption characteristics of benzoate, p-OH benzoate, salicylate, and phthalate were used as models to study the possible mechanisms involved in the interactions of organic compounds with amorphous materials. The studies were carried out in batch systems using subsoil samples of three Typic Dystrandept soils from Chile. (See also W77-00474) (Skogerboe-Colo St)
W77-00473

INTERACTIONS BETWEEN ORGANIC COMPOUNDS, MINERALS, AND IONS IN VOLCANIC-ASH-DERIVED SOILS: II. EFFECTS OF ORGANIC COMPOUNDS ON THE ADSORPTION OF PHOSPHATE,
California Univ., Riverside. Dept. of Soil Science.
H. Appelt, N. T. Coleman, and P. F. Pratt.

Soil Science Society of America Proceedings, Vol. 39, No 4, p 628-630, July-August 1975. 5 tab, 16 ref.

Descriptors: *Organic compounds, *Ions, *Adsorption, *Phosphates, Soils, *Soil investigations, Path of pollutants, South America, Anions, Soil analysis.
Identifiers: *Minerals, *Chile, *Typic Dystrandept soils, *Volcanic-ash soils.

The effects of organic compounds on phosphate adsorption by volcanic-ash-derived soils were studied using benzoate, p-OH benzoate, salicylate, and phthalate, and by humic and fulvic acids extracted from a surface soil sample of a Typic Dystrandept. The adsorption of simple organic anions that are specifically adsorbed block to some extent the adsorption sites for nonspecifically adsorbed anions such as chloride and/or nitrate. But, organic anions did not compete for or block adsorption sites for phosphate anions, because of the much higher affinity of phosphates for the adsorption sites in these volcanic-ash-derived soils. (See also W77-00473) (Skogerboe-Colo St)
W77-00474

EFFECT OF AGRICULTURAL DRAINAGE ON WATER QUALITY,
Virginia Polytechnic Inst. and State Univ., Blackstone. Southern Piedmont Center.
For primary bibliographic entry see Field 5B.
W77-00475

VARIATIONS IN PICLORAM LEACHING PATTERNS FOR SEVERAL SOILS,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
C. L. Ping, H. H. Cheng, and B. L. McNeal.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 470-473, May-June 1975. 3 fig, 2 tab, 9 ref.

Descriptors: *Leaching, Soils, *Soil investigations, *Soil texture, Pesticides, *Diffusion, *Saturated soils, Diffusivity, Porosity, *Hawaii, Electron microscopy, Path of pollutants.
Identifiers: *Picloram, Volcanic soils(Hawaii).

Laboratory studies of picloram leaching under saturated conditions were conducted for four soils. Leaching patterns could be related to variations in soil texture and pore uniformity for three soils from arid and semiarid regions. Diffusion from conducting pores into adjacent micropores appeared to be the most plausible explanation of leaching patterns obtained for an Oxisol of volcanic origin from Hawaii. Evidence supporting the presence of the postulated micropore structure in this tropical soil was obtained from constancy in flow rate, from scanning electron micrographs, and from picloram recovery at a reduced leaching rate. (Skogerboe-Colo St)
W77-00476

NITRATE REDUCTION AND NITRITE UTILIZATION BY NITRIFIERS IN AN UNSATURATED HANFORD SANDY LOAM,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5B.
W77-00478

THE MINERAL CONTENT IN SOIL AND SUBSOIL WATER CLOSE TO THE SURFACE BELOW CONIFEROUS AND ARABLE LAND IN SANDY SOIL OF NORTHWEST GERMANY, (IN GERMAN),
Landwirtschaftskammer Weser-Ems, Oldenburg (West Germany).
P. Foerster.
Forstwiss Centralbl. 94(2/3), p 67-78, 1975.

Descriptors: *Sampling, *Subsurface waters, *Soil water, Land, Arable land, Coniferous forests, *Mineral water, Mineralogy, Chlorine, Nitrogen, Phosphorus, Sulfur, Hydrogen ion concentation.
Identifiers: *Mineral content, *West Germany.

Samples of water were extracted during Feb. 1973-Jan. 1974, and tested for N03-N, NH4-N, N02-N, total P, S04-S, C1 and pH. From the depths (30-60 cm, 60-90 cm, 110-140 cm, 150-180 cm below the surface) the water was obtained by the Czeratzki suction apparatus. The subsoil water from the lowest depths (180-210 cm below the surface) was extracted by upright tubes. The N03-N content in soil and subsoil water below woodland was very little in comparison with fertilized arable land. Accordingly, the exudates of N03-N below woodland were approximately 10 times less in comparison with those of arable land. The NH4-N, N02--N and P content in soil water and subsoil water close to the surface below woodland and arable land was approximately the same. Below woodland the S04-S content in soil water was greater than that in arable land, whereas in subsoil water the S04-S content was the same. The C1 content of subsoil water close to the surface below arable land was twice as much as that below woodland.--Copyright 1976, Biological Abstracts, Inc.
W77-00493

WATER PERMEABILITY OF DARK-CHESTNUT SOILS OF THE KUSTANAI OBLAST, (IN RUSSIAN),
A. A. Naumenko.
Izv Akad Nauk Kaz SSR Ser Biol. 13(1), p 58-60, 1975.

Descriptors: *Chestnut soil *Permeability, *Soil water movement, *Cultivated lands, Arable land.
Identifiers: Kustanai oblast (USSR).

During June-Aug. water permeability on virgin land increases and on plowed areas it decreases, sometimes considerably. Permeability was maximum when spring wheat was sown on a plowed field, and minimum on virgin land. There was a marked decrease of water permeability at the end of summer on old arable fallow land.--Copyright 1975, Biological Abstracts, Inc.
W77-00501

LIGHT-CHESTNUT LONG-IRRIGATED SOIL OF THE SHARUR PLAIN, (IN RUSSIAN),
Z. R. Bairamov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 4, p 59-62, 1974.

Descriptors: Soils, Brown soils, *Chestnut soils, *Grasslands, *Irrigation effects, Soil profiles.
Identifiers: Chemical, Chestnut, Composition, Description, Irrigated, Light, Long, Morphology, Sharur plain, *Azerbaijan, *USSR.

These dry steppe soils in the Azerbaijan SSR (USSR) changed their morphological appearance under the effect of prolonged irrigation and are characterized by the presence of irrigation-borne sediments, depth of the humus profile, formation of an illuvial horizon, accumulation of a silt fraction in the middle part of the profile and sometimes the formation of an indurated horizon. Data are given on the main physicochemical indices and chemical composition of the soils.--Copyright 1975, Biological Abstracts, Inc.
W77-00510

ORIGIN AND USE OF RUDYAK SOILS, FERRUGINOUS SOLONCHAKS OF THE TAIGA ZONE, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
F. R. Zaidel'man, and R. P. Narokova.
Biol Nauki. 17(12), p 106-112, 1974.

Descriptors: Soils, Clays, Swamps, *Forest soils, Drainage systems, Agricultural engineering.
Identifiers: *Ferruginous solonchak, Jurassic clays, *Rudyak soils, *Solonchaks, *Taiga, *USSR.

Problems of the origin and use of rudyak soils (ferruginous solonchaks of the taiga zone) are discussed. These soils are formed in areas swamped by highly ferruginous groundwaters. Ferruginization of the waters and soils is due to the geologic structure of the territory, particularly the relatively close occurrence of Jurassic clays. Ways of evaluating the expediency of constructing drainage systems and agricultural development of swamped soils with rudyak horizons are given.--Copyright 1975, Biological Abstracts, Inc.
W77-00511

INFLUENCE OF AN INSERTED ASPHALT LAYER ON THE PLANT YIELD ON A LIGHT SOIL, (IN POLISH),
Instytut Uprawny Nowozenia i Gleboznaqatwa, Laskowice Olawskie (Poland). Zaklad Uprawny Roli.
For primary bibliographic entry see Field 3F.
W77-00513

THE CHANGE OF CLAY MATERIAL IN CHERNOZEMS UNDER RICE CULTIVATION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
G. M. Mainasheva, N. P. Chizhikova, and S. A. Nikolaeva.
Vestn Mosk Univ Ser 6 Biol Pochvoved. 29(6), p 74-80, 1974.

Descriptors: *Clays, *Rice, *Aquatic soils, Drowned(Submerged), *Submergence, Flooding, *Oxidation-reduction potential, *Soil chemical properties, Chemical properties, *Chernozems, Oxidation-reduction potential.
Identifiers: Montmorillonite, Shamozite, USSR.

The influence of periodic inundation under a rice crop was studied in the southern chernozems of Odessa oblast (Ukrainian SSR, USSR). The dynamics of several elements and the change in the chemico-mineralogical composition of the clay material were determined in the field cultivated with rice for 4 yr. Due to inundation the upper horizons lost their < 0.001 mm particles and their montmorillonite component. There is a possibility of the formation of the shamozite type of mineral with an imperfect structure due to the change in redox potentials of the soil.--Copyright 1975, Biological Abstracts, Inc.
W77-00523

MECHANISM OF INTERACTION OF WEAKLY MINERALIZED IRRIGATION WATER WITH SOIL, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
B. G. Rozanov, and M. A. Abdel'-Mottalib.
Biol Nauki. 18(2), p 127-130, 1975.

Descriptors: *Irrigation effects, *Soils, *Soil chemical properties, *Surface-groundwater relationships, Sodium, Potassium, Calcium, Magnesium, Mineral water.

When the irrigation and ground waters interact with the soil their composition changes considerably; the change in the composition of Na and K salts was a result of evaporation of the water, and that of Ca and Mg salts was a result of the interaction with the solid phase of the soils.--Copyright 1975, Biological Abstracts, Inc.
W77-00524

2H. Lakes

CAUSES AND ALTERNATIVE SOLUTIONS TO THE WATER QUALITY PROBLEMS OF BIG STONE LAKE, WESTERN MINNESOTA-NORTHEASTERN SOUTH DAKOTA,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5C.
W77-00047

A PHOSPHORUS RESIDENCE TIME MODEL: THEORY AND APPLICATION,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5B.
W77-00124

VOLATILE FATTY ACIDS IN BOTTOM DEPOSITS OF THE RYBINSK RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W77-00126

A SIMPLE METHOD FOR DETERMINING THE EVAPORATION FROM SHALLOW LAKES AND PONDS,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 2D.
W77-00127

ROLE OF EDDY DIFFUSIVITY IN THERMOCLINE FORMATION,
Leicester Univ. (England). Dept. of Engineering.
B. Henderson-Sellers.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE3, Proceedings Paper 12174, p 517-531, June 1976. 8 fig, 3 tab, 19 ref, 2 append.

Descriptors: *Eddies, *Model studies, *Environmental engineering, *Diffusion, Heat transfer, Hydrodynamics, Mixing, Reservoirs, Stratification, Temperature, *Thermocline, Lakes, Turbulence, Water quality, Stratified flow, Stability, Equations.
Identifiers: *Eddy diffusivity, Stratified lake, Thermocline structure, Neutral eddy diffusion.

Several functional forms for the eddy diffusivity in a lake or reservoir were analyzed for incorporation into a one-dimensional model for the vertical temperature structure of the water body. A suitable form for the neutral eddy diffusivity was found, and this was used in solution of the heat transfer equation to simulate thermocline formation and seasonal development. (Lee-ISWS)
W77-00139

CHANGE OF BENTHIC COMPLEXES UNDER THE EFFECT OF OVERGROWTH IN EUTROPHIC LAKE BALTYM, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-00140

PRESENT STATE OF ZOOPLANKTON AND ZOOBENTHOS OF LAKE ADZHIKABUL, (IN RUSSIAN),
A. G. Kasymov, F. G. Badavov, and A. R. Aliev.
Izv Akad Nauk Az Ssr Ser Biol Nauk 2, p 107-110, 1975.

Descriptors: Zooplankton, Benthos, Copepoda, Salinity, Regime, Oxygen, Lakes, Rotifers.
Identifiers: *Lake Adhikabul(USSR), Azerbaijan-Ssr, USSR.

Lake Adzhikabul (area 860 ha, length 6 km, width 3 km, depth 5 m) is located on the left bank of the Kura River in the Azerbaijan SSR (USSR). After construction of the Mingechaur hydroelectric station the lake ceased to obtain water from the Kura and began to dry up and become salty. Formerly there were 45 spp. of zooplankton, now there are 6 spp. of rotifers and 2 spp. of copepods, all salt-loving or resistant to increased salinity. The number of species of benthos has decreased from 44 to 10 in connection with the deterioration of the O2 regime and salinization of the water. Measures for improving the abiotic and biotic environment of the lake are recommended.--Copyright 1976, Biological Abstracts, Inc.
W77-00142

NUMBER, GENERATION TIME AND PRODUCTION OF BACTERIA IN WATER OF THE SARATOV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W77-00143

PILOT INVESTIGATION OF THE IMPORTANCE OF VARIOUS WETLAND TYPES TO DUCK PRODUCTION,
South Dakota State Univ., Brookings. Dept. of Wildlife and Fisheries.
J. M. Gates, and L. D. Flake.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 780, Price codees: A03 in paper copy, A01 in microfiche. Completion Report, July 1976. 32 p, 1 fig, 22 ref. OWRT A-038-SDAK(1). 14-31-0001-4042

Descriptors: *Wetlands, *Waterfowl, Reproduction, *Ducks, Water resources development, Wildlife conservation, Balance of nature, Habitat improvement, *South Dakota, Mallard ducks, Gadwall ducks, Blue-winged teal, Pintail duck.
Identifiers: Waterfowl production.

Wetland characteristics, adjacent upland conditions, and corresponding populations of breeding waterfowl broods were surveyed on 500 quarter sections in 125 clusters proportionally stratified within eight physiographic strata in South Dakota. The estimated total of breeding pairs was 1,067,500 in 1973 and 439,600 in 1974. Drought conditions occurred concurrent with the reduced 1974 populations. Blue-winged teal (Anas discors) was the major species followed by mallard (Anas platyrhynchos), pintail (Anas acuta), and gadwall (Anas strepera). Less than five percent of the total breeding pairs was composed of diving ducks (Aythyini). Striking differences in densities of breeding pairs occurred between the major physiographic regions of the state. Waterfowl densities were highest in the glaciated eastern half of South Dakota, particularly in the northern periphery of the Coteau des Prairies and the major portion of the Coteau du Missouri. The non-glaciated western half of the state had relatively low waterfowl densities but contributed 21.6 percent in 1973 and 32.3 percent in 1974 of the total breeding pairs. Class III and IV ponds and stockdams were used by a large segment of most waterfowl populations throughout the study. Stockdams were used by a larger segment of all populations in 1974 than in 1973, while the proportion of ducks using natural ponds and lakes decreased from 1973 and 1974. Dugouts closely associated with other wetlands had higher waterfowl use than those not associated with other wetlands. (Wiersma-South Dakota)
W77-00145

A FOUR-YEAR ANALYSIS OF VEGETATION FOLLOWING AN OIL SPILL IN A FRESHWATER MARSH,
Smith Coll., Northampton, Mass. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-00147

INVESTIGATION OF BACTERIOLOGICAL POLLUTION OF RECREATIONAL WATERS IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management; and Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5B.
W77-00153

ISOLATION AND IDENTIFICATION OF BLUE-GREEN ALGAE PRODUCING MUDDY ODOR METABOLITES, GEOSMIN, AND 2-METHYLISOBORNEOL, IN SALINE LAKES IN MANOTOBA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W77-00185

ALGAL PRODUCTIVITY IN 49 LAKE WATERS AS DETERMINED BY ALGAL ASSAYS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-00187

LAKE CHAMPLAIN: A CASE HISTORY ON THE CLEANUP OF NO. 6 FUEL THROUGH FIVE FEET OF SOLID ICE AT NEAR-ZERO TEMPERATURES,
Environmental Protection Agency, Edison, N. J. Region II.
For primary bibliographic entry see Field 5G.
W77-00257

EVALUATION OF TECHNIQUES FOR LONG-RANGE FORECASTING OF AIR TEMPERATURE AND ICE FORMATION,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2C.
W77-00275

LONG-RANGE FORECASTING OF MAXIMUM ICE EXTENT ON THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2C.
W77-00276

LITTORAL ZOOPLANKTON OF THE BAIKAL OPEN ZONE, (IN RUSSIAN),
Limnologicheskii Institut, Irkutsk (USSR).
E. L. Afanas'Eva.
Gidrobiol Zh 11(3), p 26-31, 1975.

Descriptors: *Zooplankton, *Littoral, Lakes, Crustaceans, Rotifers.
Identifiers: Cyclopidae, *Epischura, USSR, *Lake Baikal(USSR).

Zooplankton of the Baikal (USSR) littoral zone, a narrow shelf area without large inflows and bays is under the constant influence of the waters of the open zone of the lake. A dominating form here is the Baikal endemic Epischura. Periods of appearance and development of Cyclopidae, Cladocera and lake rotifers coincide with those in the open zone, with a predominance of these forms in the littoral. Sharp changes in zooplankter number are observed at constant stations with daily sampling, caused by a spotty distribution of zooplankton and the dynamics of water masses in this region.--Copyright 1976, Biological Abstracts, Inc.
W77-00333

ON THE EUTROPHICATION IN THE LAKE CHANGJA, (IN KOREAN),
Seoul National Univ. (Republic of Korea). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-00344

APPENDIX 4, LIMNOLOGY OF LAKES AND EMBAYMENTS, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Mich. Public Information Office.
1976. 441 p, 301 fig, 95 tab, 923 ref.

Descriptors: *Great Lakes Region, *Lake Erie, *Lake Huron, *Lake Michigan, *Lake Ontario, *Lake Superior, *Geomorphology, Physical properties, *Limnology, *Climatology, Hydrology, Chemical properties, Biological properties, *Sedimentology, Water utilization, Great Lakes, Lakes, *Bays, Precipitation(Atmospheric), Evaporation, Water levels, Water temperature, Radiation, Water level fluctuations, Ice cover, Iced lakes, Currents(Water), Density currents, Water circulation, Trace elements, Bacteria, Coliforms, Data collections, Bottom sediments, Sediment distribution, Ice, Meteorology.
Identifiers: Upland lakes.

This appendix presented the processes that underlie the hydrology, hydrodynamics, biology, and chemistry of the Great Lakes, harbors, embayments, and upland lakes in the Great Lakes Basin; also, current knowledge of the limnological processes was synthesized. The appendix also aids the development of a comprehensive plan for optimum utilization of water and related land areas by doing the following: (1) synthesizing the limnological data applicable to regional planning considerations; (2) describing the limnological processes of the Great Lakes and of the upland lakes of the Great Lakes Basin in such a fashion that they may be logically interrelated; (3) identifying those regions in which insufficient data exist for water resource planning and defining the data deficiencies; (4) identifying those physical, chemical, and biological processes that are inadequately understood and require further study; (5) defining those Great Lakes water resource problems that exist or that may arise by the year 2020; and (6) serving as a basic data source use and management appendixes. The data used in this report were obtained from material either in print or readily accessible from local, State, and Federal agencies. (See also W76-03862 through W76-03870) (Humphreys-ISWS)
W77-00358

POSSIBILITIES OF DETERMINING COMMUNITY BOUNDARIES WITHIN THE LIMITS OF A LAKE ECOSYSTEM, (IN RUSSIAN),
Nature Conservation, Game Preserves and Hunting, Moscow (USSR). Central Lab.
N. V. Vehov.
Zh Obshch Biol 36(3), p 382-388, 1975.

Descriptors: Lakes, *Ecosystems, *Zooplankton, *Littoral, Depth, Biomass, *Biological communities.
Identifiers: *Pelagial depth, *Lake Yanei-Ty(USSR).

The zooplankton of Lake Yanei-Ty (Bolshezemskaya Tundra) (USSR) were used to study the possibility of establishing the spatial limits of the littoral (depths to 1.5 m) and pelagial (depths to 4-6.5 m) zooplankton communities. The species composition of zooplankton was similar in both biotopes, but the species exhibited population density peaks at different times in the littoral and pelagial, their population density also being different. The highest abundance and maximum biomass were observed in different periods; the ratios of the principal taxa and trophic groups in the plankton were different in the course of the observation periods changes in the ratio of these groups occur within the limits of each biotope. The species diversity and biomass was characteristic in the littoral, but it was positive for the pelagial. Such regularities were not detected for all the points throughout the lake when estimating the correlations. This lake contains 2 different plankton communities inhabiting different natural areas of the lake and having many discriminating features, though their species composition may be identical.—Copyright 1976, Biological Abstracts, Inc.
W77-00367

EVENTS IN THE DJERDAP RESERVOIR IMMEDIATELY AFTER IMPOUNDMENT, (IN GERMAN),
Institute for Biological Research, Belgrade (Yugoslavia).
G. Petrovic.
Arch Hydrobiol Supplementb. 44(4), p 383-391, 1975.

Descriptors: *Reservoirs, *Impoundments, *Rivers, Chemical reactions, *Physicochemical properties, *Post-impoundment.
Identifiers: *Djerdap Reservoir, *Yugoslavia, *Danube River.

The analyses of the changes in space and time occurring in the recently impounded reservoir of Djerdap, contribute to a better understanding of the physical-chemical changes which occurred in that sector of the Danube (Yugoslavia).—Copyright 1976, Biological Abstracts, Inc.
W77-00409

ZOOPLANKTON OF THE AKSTAFA RESERVOIR, (IN RUSSIAN),
N. B. Talybov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 1, p 85-88, 1975.

Descriptors: Reservoirs, *Zooplankton, Plankton, *Sampling, Rivers, Biomass, Water sampling.
Identifiers: *Akstafa Reservoir, Asplanchna-Priodonta, Azerbaijan SSR, Bosmina-Longirostris, Brachionus-Rubens, Cyclops-Strenuus, Daphnia-Longispina, Dunhevedi-Crassa, Eucyclops-Serrulatus, Lecane-Bulla, Moina-Rectirostris, *USSR.

An investigation of water samples taken from the Akstafa reservoir (area 630 ha), constructed in 1969 on the Akstafachai River near the city of Kazkh in the Azerbaijan SSR (USSR), revealed 24 spp. of zooplankton (9 spp. of Rotatoria, 11 Cladocera and 4 Copepoda), of which only 3, Daphnia longispina, Eucyclops serrulatus and Cyclops strenuus, were dominant species and another 6 subdominant, Brachionus rubens, Asplanchna priodonta, Lecane bulla, Moina rectirostris, Dunhevedi crassa, Bosmina longirostris. Data are given on the seasonal change of the numbers and biomass of these 9 species. The species composition, number and biomass of zooplankton of the Akstafa reservoir are compared with other reservoirs of the Azerbaijan SSR.—Copyright 1976, Biological Abstracts, Inc.
W77-00416

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 4. ST. LAWRENCE RIVER BASIN--VOLUME 2. ST. LAWRENCE RIVER BASIN BELOW LAKE HURON.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W77-00431

THE NUTRIENTS AND PLANTS OF LAKE JOONDALUP, A MILDLY EUTROPHIC LAKE EXPERIENCING LARGE SEASONAL CHANGES IN VOLUME,
Western Australia Univ., Nedlands. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-00442

A COMPARATIVE STUDY OF THE LIMNOLOGY OF THREE MAAR LAKES IN WESTERN VICTORIA (AUSTRALIA), 1. PHYSIOGRAPHY AND PHYSICOCHEMICAL FEATUES,
Monash Univ., Clayton (Australia). Dept. of Zoology.
B. V. Timms.
Australian Journal of Marine and Freshwater Research, Vol 27, No 1, p 35 - 60, March 1976. 16 fig, 8 tab, 40 ref.

Descriptors: *Saline lakes, Aquatic environment, Limnology, *Australia, Lakes, Craters, *Salinity, Water temperature, Dissolved oxygen, Light penetration, Stratification, Lake sediments, Hydrogen ion concentration, Seasonal, Organic matter, Oxygenation, Oxidation-reduction potential.
Identifiers: Lake Purrumbete(Vic.), Lake Bullenmeri(Vic.), Lake Gnotuk(Vic.), *Maar lakes(Australia).

Three typical maar lakes in western Victoria were selected for study because although of similar size, altitude and (volcanic) origin, they vary in salinity from fresh to markedly saline, providing an unusually favourable opportunity for investigating the effect of salinity on the ecology of athalassic lakes. The major physiographic and physicochemical features of the lakes are described, with emphasis on variation, between lakes and seasonally. Factors discussed include salinity, pH, oxygenation, temperature, transparency, stratification, and the nature, organic matter content and redox potentials of the sediment. (CSIRO)
W77-00447

YELLOW SUBSTANCE (GELBSTOFF) AND ITS CONTRIBUTION TO THE ATTENUATION OF PHOTOSYNTHETICALLY ACTIVE RADIATION IN SOME INLAND AND COASTAL SOUTH-EASTERN AUSTRALIAN WATERS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 5C.
W77-00448

NUTRIENT STATUS OF THE SEDIMENTS IN LAKE MULWALA, 1. TOTAL PHOSPHORUS,
Caulfield Inst. of Tech. (Australia). Dept of Chemistry.
For primary bibliographic entry see Field 5C.
W77-00450

NUTRIENT ECONOMIES AND TROPHIC STATUS OF LAKES SORELL AND CRESCENT, TASMANIA (AUSTRALIA),
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-00451

FATE OF SELECTED ORGANIC COMPOUNDS IN THE DISCHARGE OF KRAFT PAPER MILLS INTO LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington, (Ontario).
For primary bibliographic entry see Field 5B.
W77-00457

PERSISTENT ORGANIC COMPOUNDS FROM A PULP MILL IN A NEAR-SHORE FRESHWATER ENVIRONMENT,
Canada Centre for Inland Waters, Burlington, (Ontario).
For primary bibliographic entry see Field 5B.
W77-00458

LAKES MARION-MOULTRIE STREAM SYSTEM INVESTIGATION: PART II-SIMULATION STUDIES,
Geological Survey, Columbia, S.C.
For primary bibliographic entry see Field 4A.
W77-00488

MORPHO-ECOLOGICAL CHARACTERISTICS OF THE IDE, LEUCISCUS IDUS (LINNE), FROM THE KREMENCHUG RESERVOIR. (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
V. P. Bruenko, Yu. V. Movchan, and A. I. Smirnov.
Gidrobiol Zh. 10(5), p 70-79, 1974.

Descriptors: Fish, *Freshwater fish, Fish genetics, Fish physiology, Fish populations, Fish reproduction, Reservoirs.
Identifiers: *Ide, Kremenchug reservoir(USSR) Leuciscus-Idus, Ukrainian-SSR, *USSR.

Analyses based on morphometry, size-weight and age compositions, growth rate, fatness, fecundity and reproduction peculiarities of ide in the Kremenchug (Ukrainian SSR, USSR) show small changes in its ecological niche. A considerable increase was observed in the recent catch. The reasons forthis phenomenon are considered and measures to preserve the reserves are recommended.--Copyright 1975, Biological Abstracts, Inc.
W77-00504

CONSUMPTION OF ORGANIC MATTER OF MUDS BY ILYOCRYPTUS SORDIDUS (CLADOCERA, MACROTHRICIDAE), (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W77-00507

CHEMICAL COMPOSITION AND FOOD VALUE OF SOME MEMBERS OF FRESHWATER ZOOPLANKTON IN PONDS OF THE SOUTHERN MOLDAVIAN SSR, (IN RUSSIAN),
V. I. Ashevskii.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk. 6, p 49-53, 1974.

Descriptors: *Zooplankton, *Chemical properties, Crustaceans, Copepods, Phytoplankton, *Mineral water, Ponds.
Identifiers: Acanthocyclops-Cernalis, Bosmina-Longirostris, Cladocera, Cyclops-Vicinus, Daphnia-Magna, Diaptomus-Coeruleus, Keratella-Quadrata, Moina-Micrura, Moldavian-SSR, Rotatoria, USSR, Food value.

The dependence of the chemical composition of some members of freshwater zooplankton (Rotatoria: Keratella quadrata; Cladocera: Daphnia magna, Moina micrura, Bosmina longirostris; Copepoda: Cyclops vicinus, Acanthocyclops vernalis, Diaptomus coeruleus) on the composition and quantity of phytoplankton and degree of mineralization of water in some ponds in the southern Moldavian SSR (USSR) is discussed. The content of mineral substances in members of Cladocera and Copepoda depends not only on the degree of mineralization of the water but also on the quantitative relationship of the alcium carbonate equilibrium in it. In a food respect (total content of fat, protein and organic matter) the investigated members of Copepoda are distinguished by a greater calorific value than the investigated members of Cladocera, except for B. longirostris having a maximum calorific value (6.78%). The chemical composition of the investigated crustaceans is subject to considerable variation depending on the ecological and trophic conditions of the ponds.--Copyright 1975, Biological Abstracts, Inc.
W77-00509

SEASONAL SUCCESSION AND VERTICAL DISTRIBUTION OF PHYTOPLANKTON IN LAKE HAYES AND LAKE JOHNSON, SOUTH ISLAND, NEW ZEALAND,
Otago Univ., Dunedin (New Zealand). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-00517

FECUNDITY OF NELMUSCHKA COREGONUS LAVARETUS NELMUSCHKA PRAVDIN AND ITS ECOLOGICAL BACKGROUND, (IN RUSSIAN),
Vologodskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
V. G. Lebedev.
Vopr Ikhtiol. 15(1), p 58-63, 1975.

Descriptors: *Lakes, Fish, *Fish reproduction, *Environmental effects, Ecology.
Identifiers: Coregonus-lavaretus-nelmuschka, Nelmuschka, Russian-SFSR, USSR, *Whitefish, *Beluga.

The results of an investigation of the dwarf lake-river whitefish, nelmuschka (C. lavaretus nelmushckr) in Lake Kubenskoye in the Vologda Oblast of the Russian SFSR (USSR) are presented. The Kubenskoye nelmuschka is characterized by a decrease in absolute fecundity and increase of relative fecundity and of species fecundity in comparison with other forms of this species. The fecundity of the nelmuschka depends not only on body weight but on environmental conditions. The dwarf growth and fecundity characteristics are evidence that the Kubenskoe nelmuschka exists at the extreme limits of its ecological amplitude. Any deterioration of the habitat of this whitefish will cause its death.--Copyright 1975, Biological Abstracts, Inc.
W77-00518

ROLE OF PREDATORY CLADOCERA IN THE FEEDING OF THE CHARKHAL KILKA CLUPEONELLA DELICATULACASPIA MORPHA TSCHARCHALENSIS (BORODIN) IN KUIBYSHEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Tolyatti. Institut Biologii Vnutrennykh Vod.
A. V. Kogan.
Vopr Ikhtiol. 15(1), p 126-130, 1975.

Descriptors: *Predation, *Crustaceans, *Reservoirs, *Smelts, Zooplankton, *Fish food organisms, *Fish diets, Seasonal.
Identifiers: Bythotrephes-longimanus, Charkhal smelts, Clupeonella-delicatula-caspia-tschar, Kilka, Kuibyshev reservoir, Leptodora-kindtii, Russian-SFSR, USSR.

An analysis was made of the food spectrum of underyearling and yearling Charkhal kilka (Clupeonella delicatula caspic m. tscharchalensis) and its seasonal and local variations in the e Kuibyshev Reservoirs (Russian SFSR, USSR.) on the Volga. Indices of selection of food objects of the 2 age groups were calculated. From the end of the 1st summer, large predatory forms of zooplankton such as Leptodora kindtii and Bythotrephes longimanus became the favorite food of the kilka. To evaluate the role of the kilka in a body of water the consumption of predatory and filter-feeding forms of zooplankton by the kilka school should be investigated.--Copyright 1975, Biological Abstracts, Inc.
W77-00520

2I. Water In Plants

PRESENCE OF SPRING AND WINTER RACES OF THE NELMA IN THE OB RIVER, (IN RUSSIAN),
N. A. Prusevich.
Ekologiya. 6(2), p 88-90, 1975.

Descriptors: *Fish, Anadromous fish, Rivers, Fish reproduction, *Spawning, Seasonal.
Identifiers: *Nelma, Ob River, Russian-SFSR, *Stendous-Leucichthys-Nelma, USSR.

The nelma (Stendous leucichthys nelma) is valuable semi-anadromous fish of the Ob basin (Russian SFSR, USSR). Two independent races of the nelma, spring and winter, exist in the Ob River. This division of the nelma into winter and spring races is a species adaptation permitting maximum use of the Upper Ob with its favorable breeding condition as a spawning ground. The winter race is probably an intermediate step from the purely semi-anadromous spring form to a freshwater form.--Copyright 1976, Biological Abstracts, Inc.
W77-00057

STUDY OF THE URAL RIVER BENTHOS, (IN RUSSIAN),
Tsentralnyi Nauchno-Issledovatelskii Institut Osetrovogo Khozyaistva, Guryev (USSR). Uralskii-Kaspiiskii Otdelenie.
T. I. Zachetnova.
Gidrobiol Zh. 11(2), p 34-38, 1975.

Descriptors: *Rivers, *Benthos, Population, *Biomass, Distribution, Diptera, Dragonflies, *Oligochaetes, Invertebrates.
Identifiers: *Corophiidae, *Sturgeon, *Ural River, USSR, *Zoobenthos.

Data on the quantitative distribution of zoobenthos in the lower reaches of the Ural River (USSR) are given for the 1st time. Zoobenthos is significant for reproduction of sturgeon. The species composition of the predominant forms is presented. The number of benthic invertebrates varies from 40-5740 (average, 764) samples/m2, biomass from 0.05-20.00 (average, 2.54) g/m2 and, taking into account large mollusks, 10.46 g/m2. The numbers of Oligochaeta, Corophiidae, and Chironomidae are largest. The maximum biomass was observed for Chironomidae, Oligochaeta and dragon-fly larvae. The highest density indices were those of the larvae of Chironomidae (6.64), Oligochaeta (6.18) and Corophiidae (3.67).--Copyright 1976, Biological Abstracts, Inc.
W77-00091

PILOT INVESTIGATION OF THE IMPORTANCE OF VARIOUS WETLAND TYPES TO DUCK PRODUCTION,
South Dakota State Univ., Brookings. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 2H.
W77-00145

LEAF PHOTOSYNTHESIS: THE INFLUENCE OF ENVIRONMENTAL VARIABLES,
Purdue Univ., Lafayette, Ind. Dept. of Mechanical Engineering.
F. P. Incropera.
Journal of Environmental Quality, Vol, 4, No. 4, p 440-447, October-December 1975. 13 fig, 35 ref, append.

Descriptors: *Crop response, *Model studies, *Corn(Field), *Photosynthesis, Environmental effects, Environmental control, Environment, *Leaves, Mathematical models.
Identifiers: *Leaf photosynthesis.

A model is presented for the effects of light intensity and ambient temperature, relative humidity, and carbon dioxide concentration on leaf photosynthesis. The model treats diffusion and chemical processes occurring within the leaf, as well as the transfer of mass and energy between the leaf and its environment. Calculations have been performed for Zea mays L. (maize) which suggest the influence of environmental changes. Although leaf energy exchange processes act to moderate the effect of changes in the atmospheric temperature, a severe cooling trend may cause as

much as 20% reduction in photosynthesis. Under most conditions, the rate of photosynthesis is further diminished by a reduction in relative humidity. In contrast, a 20% increase in the atmospheric CO2 concentration, which is projected for the year 2000, will increase photosynthesis by approximately 15%. The calculations also suggest optimum ambient conditions for controlled growth environments such as a green house. (Skogerboe-Colorado State)
W77-00302

PHYLOGENY OF THE FAMILY CALANIDAE(COPEPODA) ON THE BASIS OF A COMPARATIVE MORPHOLOGICAL ANALYSIS OF ITS CHARACTERS,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W77-00394

INTRODUCTION TO THE KNOWLEDGE OF FRESHWATER INVERTEBRATES AND THEIR ENVIRONMENT, (IN DUTCH),
Rijksinstituut voor Natuurbeheer, Leersun (Netherlands).
L. W. G. Higler.
Wet Meded K N N V (K Ned Natuurhist Ver), 103, p 1-40, 1975.

Descriptors: *Invertebrates, *Freshwater animals, Analytical techniques, Sampling, *Ecology, Water pollution, Energy, *Environment, *Bioindicators.
Identifiers: *Netherlands.

This introduction is meant for beginners in the study of freshwater invertebrates, students and laymen. A simple key is given for visible and moving invertebrates, leading to existing keys at the order level. Most figures are given as examples of these orders. Sampling and conservation are discussed. Some ecological principles on bio-communities are considered, based on food chain and energy flow. The various kinds of water pollution and of saprobic systems are explained. The possibilities and the failure of these systems in the Dutch waters are discussed. A number of organisms that can be used in the Netherlands as indicators of more or less polluted situations on the basis of existing saprobic systems, are described.--Copyright 1976, Biological Abstracts, Inc.
W77-00410

SIGNIFICANCE OF WATER VEGETATION IN DESMAN LANDS OF THE EUROPEAN SECTION OF THE USSR, (IN RUSSIAN),
Akademiya Nauk URSR, Voroshilovgrad. Voroshilovgrad State Reservation.
V. P. Samarin.
Vestn Zool. 3, p 25-28. 1975.

Descriptors: *Rivers, *Vegetation, Aquatic animals, *Mammals, *Rodents, Europe, Ecology, *Plant growth, Growth rates.
Identifiers: *Desman lands, Desmana-Moschata, *USSR.

Ecological conditions of desman lands were studied for 1971-1972 in the Voroshilovgrad State Reservation of the Ukrainian Academy of Sciences (USSR). The areas in the high-water beds of the rivers Kotorosl (the Yaroslavl Oblast), Oka (the Murom district, the Vladimir Oblast), Bityung and Khoper (the Voronezh Oblast) most densely inhabited by desman (Desmana Moschata) were also examined in the autumn of 1972. A definite relationship was found between the growth of vegetation in the rivers and density of desman .--Copyright 1976, Biological Abstracts, Inc.
W77-00411

CALORIC VALUES OF THE MOST ABUNDANT INVERTEBRATES OF TWO WOODLAND-BROOKLETS OF THE 'NATURPARK KOTTENFORST-VILLE', (IN GERMAN),
Bonn Univ. (West Germany). Institut fuer Landwirtschaftliche Zoologie und Bienenkunde.
N. Caspers.
Arch Hydrobiol. 75(4), p 484-489, 1975.

Descriptors: *Invertebrates, Heat, Brooks, Energy, Streams, Europe.
Identifiers: *Caloric values(Invertebrates), *West Germany, Aeschna-cyanea, Asellus-aquaticus, Baetis-rhodani, Crenobia-alpina, Dugesia-gonocephala, Erpobdella-octoculata, Eusimulium-sp., Gammarus-fossarum, Glossiphonia-complanata, Hydropsyche-sp., Invertebrates, Isoperla-gortzi, Kottenforst, Leptophlebia-marginata, Limnephilidae, Naturpark, Nemoura-sp., Plectrocnemia-conspersa, Radix-peregra-ovata, Rhithrogena-semicolorata, Rhyaco-phila-fasciata.

Caloric values of 18 abundant invertebrates of 2 woodland brooklets near Bonn (West Germany) were determined on a dry weight basis and on an ash-free dry weight basis. (Crenobia alpina,Dugesia genocephala, Radix peregra ovata, Glossiphonia complanata, Erpobdella octoculata, Ascellys aquaticus, Gammmarus fossarum, Baetis rhodani, Rhithrogena semicolorata, Leptophlebia marginata, Nemoura sp., Isoperia gortzi, Aeschna-cyanes, Rhyacophila fasciata, Hydropsyche sp., Plectrocnemia conspersa, Eusimulium sp., Limnephilidae).--Copyright 1976, Biological Abstracts, Inc.
W77-00415

BIOHYDRODYNAMIC CHANNEL FOR FIELD TRIPS, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 7B.
W77-00417

EFFECT OF OSMOTIC SUCTION ON THE GERMINATION OF WARM SEASON GRASSES, (IN JAPANESE),
Kyushu Agricultural Experiment Station, Kumamoto (Japan).
K. Okamoto, M. Kawatake, and S. Horiuchi.
J Jpn Soc Grassl Sci. 21(1), p 16-20, 1975.

Descriptors: *Grasses, Soil moisture, *Osmotic pressure, *Germination, *Sorghum.
Identifiers: Love grass, Makarikari grass, Millet, Panicum-Spp., Rhodes grass, *Osmotic suction.

This study was undertaken to obtain information for selecting the warm season grasses suitable for mineral soil which has poor physical conditions and to control the soil moisture conditions in seed bed layer by watering or other methods. The relationships between osmotic suction (+ atm) and the seed germination of warm season grasses as examined in a controlled temperature room kept at 29-30 C. Osmotic solutions were prepared and adjusted by polyethylene glycol. The germination percentage in all species lowered with the increase of osmotic suction, but the degree of decline varied considerably. Germination characteristics among the species differed by the levels of osmotic suction. In general, the germination percentage in those species with relatively small seeds such as Panicum spp. and Rhodes grass was much more severely affected and lowered by lower osmotic suction in comparison with the spp. with large seeded taxa such as Sorghum and millet. Among the species of small seed, Love grass and Makarikari grass were less severely affected. The germination rate of almost all species declined linearly with the increase of osmotic suction, but interspecific differences were not as recognizable as those observed in the decline of germination percentage.--Copyright 1976, Biological Abstracts, Inc.
W77-00422

EFFECT OF SOIL WATER SUCTION ON THE GERMINATION AND EMERGENCE OF WARM SEASON GRASSES, (IN JAPANESE),
Kyushu Agricultural Experiment Station, Kumamoto (Japan).
K. Okamoto, and S. Horiuchi.
J Jpn Soc Grassl Sci. 21(1), p 21-25, 1975.

Descriptors: *Grasses, Soil moisture, *Osmotic pressure, *Germination, Sorghum.
Identifiers: Millet, Panicum-Spp., Rhodes grass, Osmotic suction.

The interrelation between soil water suction and germination and the emergence above the soil surface after germination was investigated at 30 C constant temperature using representative warm season grasses. Water suction-water content curve of the mineral soil was tested. The percentage of germination and emergence of all spp. did not vary at the lower levels of soil water suction and decreased rapidly at some levels above the limit of water suction. The degree of such decline varied by the species and Sorghum spp. and millet emerged well in the higher levels of soil water suction. Among the small seed species, Panicum spp. and Rhodes grass were much more severely affected at increased soil water suction and decreased rapidly at some levels over the limit of water suction. Soil water suction values permitting the relative germination and emergence percentage of 0% and 50% (percentage of 0.03 atm = 100) and also that over which emergence percentage lowered rapidly are given. The rate of emergence of most species declined slowly with the increase of soil water suction at the lower levels in which the percentage of emergence did not decline and decreased rapidly at the levels above the limit of water suction. There were no differences among the species in the degree of such reduction.--Copyright 1976, Biological Abstracts, Inc.
W77-00423

EFFECT OF IRRIGATION PUMPING ON DESERT PUPFISH HABITATS IN ASH MEADOWS, NYE COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 8I.
W77-00427

SPECIES DIVERSITY OF FRESHWATER PLANKTON AGGLOMERATIONS, (IN POLISH),
For primary bibliographic entry see Field 7B.
W77-00495

THE BROADLEAF EVERGREEN FORESTS OF JAPAN, (IN GERMAN),
For primary bibliographic entry see Field 4A.
W77-00499

WATER RELATIONS OF GLYCYRRHIZA GLABRA L. UNDER DESERT CONDITIONS,
Cairo Univ., Giza (Egypt). Dept. of Botany; and Cairo Univ., Giza (Egypt). Faculty of Science.
A. A. Abd El-Rahman, K. H. Batanouny, and K. M. Zayed.
Flora (Jena). 163(1/2), p 143-155, 1974.

Descriptors: *Deserts, *Plant growth substances, *Soil-water-plant relationships, *Transpiration, Osmotic pressure, *Water requirements, Moisture uptake, *Drought tolerance.
Identifiers: *Glycyrrhiza-glabra.

The water relations of G. glabra L. under desert condition, including the water expenditure, osmotic pressure of the plant sap and the water saturation deficit, were studied in different localities. Transpiration measurements show that the plant transpires at relatively higher rates than desert plants. The curves of the diurnal march of the transpiration and those of the stomatal aperture showed almost the same trend, indicating a

strong stomatal control on transpiration. There is lack of parallelism between both curves and those of the climatic factors, particularly in dry months. Two types of transpiration curves are recognized, viz. the single-peaked curves with early maximum in dry months and the dome-shaped curves without prominant peak in months with mild climatic conditions. Comparison of the mean monthly transpiration rates in 2 localities revealed that the transpiration was higher in the locality with better water supply. Generally, there is a discrepancy between the mean values of transpiration and those of vapor pressure deficit and evaporation. The plant exhibited high values of osmotic pressure and water saturation deficit which increased later in the growing season. These values were higher in the locality with relatively low available soil moisture. The plant withstands high water deficits for long periods. The mechanisms for drought endurance are discussed.--Copyright 1975, Biological Abstracts, Inc.
W77-00500

DIET OF HIPPOGLOSSINA MACROPS (STEINDACHNER) IN MEJILLONES (PISCES, BOTHIDAE), (IN SPANISH),
Universidad de Norte, Antofagasta (Chile).
For primary bibliographic entry see Field 2L.
W77-00502

EFFECT OF DEHYDRATION AND ELEVATED TEMPERATURE ON LEAF CELL THERMORESISTANCE OF A DROUGHT-SENSITIVE BARLEY CULTIVAR, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Lab. of Cytophysiology and Cytoecology.
I. G. Zavadskaya, and G. G. Shukhtina.
Tsitologiya. 16(8), p 950-955, 1974.

Descriptors: *Barley, *Drought tolerance, Heat balance, *Soil-water-plant relationships, *Dehydration, Water requirements, Cultivation.
Identifiers: Hordeum-Sativum.

Dehydration of intact plants or detached leaves of the drought-sensitive barley (Hordeum sativum) cultivar 'Winer' did not affect the primary cellular thermoresistance. Heat hardening of whole plants treated with soil drought for 4 days (decrease of water content in leaves by 35%) increased resistance of cells to heating, shifting the curves towards the area of higher temperatures as compared to the curve of thermoresistance of cells heathardened in saturated state. Rapid dehydration for 3 h (loss of water in leaves by 35%) of detached leaves did not produce additional effects during heat hardening. In contrast to the situation with 'Winer' drought-sensitive varieties required prolonged dehydration treatment to obtain enhanced effect of heat hardening.--Copyright 1975, Biological Abstracts, Inc.
W77-00503

MORPHO-ECOLOGICAL CHARACTERISTICS OF THE IDE, LEUCISCUS IDUS (LINNE), FROM THE KREMENCHUG RESERVOIR. (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2H.
W77-00504

ON THE INFLUENCE OF WATER CURRENTS ON THE GROWTH OF HYDRORHIZAL COLONIES, (IN GERMAN),
Ruhr-Universitaet Bochum (West Germany). Institut fuer Spezials Zoologie.
V. Petriconi, and G. Plickert.
Verh Dtsch Zool Ges. 67, p 107-111, 1974.

Descriptors: *Plant growth, *Currents(Water), *Rheotropism, Method, Measurement.
Identifiers: Eirene-Viridula, *Hydrorhizal colonies, *Stolons.

A water tunnel for studying the influence of current on stolonal colonies is described. A new method for measuring rheotropism is introduced. Eirene viridula (Hydroidea) prefers growing against the direction of flow. A stolon gragment when settled perpendicular to the direction of water flow starts bipolar branching with increased unilateral outgrowth of stolons against the direction of flow; when settled parallel to the water movement, branching is unipolar against the direction of flow.--Copyright 1975, Biological Abstracts, Inc.
W77-00506

CHEMICAL COMPOSITION AND FOOD VALUE OF SOME MEMBERS OF FRESHWATER ZOOPLANKTON IN PONDS OF THE SOUTHERN MOLDAVIAN SSR, (IN RUSSIAN),
For primary bibliographic entry see Field 2H.
W77-00509

METHOD OF SIMULTANEOUS DETERMINATION OF WATER CONDUCTIVITY OF SOILS AND PLANTS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
E. V. Shein.
Biol Nauki. 17(12), p 125-129, 1974.

Descriptors: *Water pressure, Soils, Corn(Field), Beans, Transpiration, *Soil-water-plant relationships, Water utilization, *Conductivity, *Hydraulic conductivity, Capillary conductivity.
Identifiers: Horse beans.

The water pressure in soil, roots and leaves of horse beans and corn and the transpiration of plant leaves were studied. The coefficients of water conductivity of soils and plants were then calculated. During soil drought the coefficient of water conductivity of plants is 150-200 times greater than that of soil and does not considerably affect water transport. The main part of the total resistance to water transport in the soil-plant system is concentrated in the soil.--Copyright 1975, Biological Abstracts, Inc.
W77-00512

SEASONAL ACTIVITY AND ENVIRONMENTAL CONTROL OF FORAGING OF THE SUBTERRANEAN TERMITE, HETEROTERMES AUREUS (SNYDER), IN A DESERT GRASSLAND,
Arizona Univ., Tucson. Dept. of Entomology.
M. I. Haverty, J. P. Lafage, and W. L. Nutting.
Life Sci. 15(6), p 1091-1101, 1974.

Descriptors: Grasslands, Deserts, *Arizona, *Sampling, *Analytical techniques, Environmental factors, Rainfall, Temperature, *Feeding rates.
Identifiers: *Foraging, *Heterotermes-Aureus, *Termites.

This research was conducted on a shrub-invaded desert grassland ecotone 40 km S of Tucson, Arizona. To examine the abiotic factors affecting or regulating foraging of subterranean termites, a modified bait sampling method using toilet paper rolls was developed. Observations of foraging activity of H. aureus (Snyder) were made during 24-h periods each wk for 1 yr. Pertinent environmental data were collected at each check. H. aureus foraged day and night throughout most of the yr with minimal activity from Dec.-Feb. Foraging intensity increased moderately in the spring and fall and was high but erratic during the summer months. The number of foragens generally increased with increasing temperature. Rainfall had little effect on foraging when daily mean soil temperature were below 20C (toilet paper roll-soil interface); however, even the slightest amount of rain during the hot summer months greatly increased foraging intensity. Above 33C, even with precipitation, foraging numbers plumeted. The number of surface foragers at any instant (Y) is best explained by the equation, $\ln Y = -0.985 - 0.0761 T + 2.928 \ln T + 0.327 \ln R$ where T is the temperature at the roll-soil interface and R is daily rainfall. It appears that foraging activity is not endogenously controlled; rather it is exogenously controlled by temperature and moisture.--Copyright 1975, Biological Abstracts, Inc.
W77-00515

EVOLUTIONARY ASPECT OF THE REPRODUCTIVE EVOLOGY OF SALMON OF THE GENUS SALMO IN SOME WATER BODIES OF KAMCHATKA, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. Of Ichthyology.
K. A. Savvaitova, M. V. Mina, and V. A. Maksimov.
Vopr Ikhtiol. 15(1), p 21-31, 1975.

Descriptors: *Rivers, *Salmon, Population, *Fish populations, *Spawing, Fish reproduction.
Identifiers: Kamchatka, Russian-SFSR, Salmomykiss, USSR.

The absence of freshwater populations of the Kamchatka salmon S. mykiss in the basins of small rivers of the W coast of Kamchatka (Russian SFSR, USSR) is probably due to the insufficient food content of these rivers. The absence of a migratory form in the Kamchatka River basin is due to the lack of suitable spawning grounds. During the evolution of the freshwater form of S. mykiss from the migratory form, the settlement of small streams occurred. The main factor that limited the abundance of spawning populations was apparently the lack of a spawning substrate. The high food content of the Kamchatka River basin enabled the salmon, having been transformed from a migratory to a freshwater form, to shorten the migration route (and thereby to reduce energy expenditures) while preserving the general scheme of the life cycle of the migratory form.--Copyright 1975, Biological Abstracts, Inc.
W77-00519

CAUSES OF A GREATER EFFECT OF PREDATORS ON NON-PREDATORY FISH POPULATIONS IN LOW LATITUDES, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology.
G. V. Nikol'skii.
Zh Obshch Biol. 35(3), p 346-352, 1974.

Descriptors: *Predation, *Fish prey, Fish diets, *Food chains, Tropic, *Tropical regions, Fish food organisms.

An analysis of the ratio of fishes with different modes of feeding in the faunas of marine and continental water bodies shows that, in low latitudes, predatory fishes feeding mainly on herbivorous ones represent the 3rd link in food chains. This and better utilization of food explain their higher proportion in the tropics than in the temperate zones.--Copyright 1975, Biological Abstracts, Inc.
W77-00521

FEEDING OF SHEEFISH IN THE UPPER OB ABOVE THE DAM OF THE NOVOSIBIRSK HYDROELECTRIC STATION, (IN RUSSIAN),
Tomskii Pedagogicheskii Institut (USSR). Lab. of Ecology.
L. A. Koneva.
Biol Nauki. 16(9), p 24-27, 1973.

Descriptors: *Fish, Rivers, Dams, *Fish populations, *Fish reproduction, *Fish diets, *Growth rates.
Identifiers: Gobio-gobio, Leuciscus-idus, Novosibirsk, Perch, Pike, Ruff, Rutilus-rutilus, *Sheefish, Stenodus-leucichthys-nelma, *USSR, *Ob River.

An investigation of the feeding of the population of river-bound sheefish (Stenodus leucichthys

nelma) formed upstream of the Novosibirsk hydroelectric station dam showed age-associated and seasonal changes in the food spectrum of the sheefish in comparison with the semi-anadromous sheefish of the Ob River (USSR). The absence of competition with other predators for food and the abundance of the roach (Rutilus rutilus), which is the main food of the sheefish in all seasons, indicates that the trophic conditions in the newly created body of water are favorable for the sheefish and promote its rapid growth and high reproductive capacity. (Leuciscus idus, perch, pike, ruff, Gobio gobio and bream are also cited as food.)--Copyright 1975, Biological Abstracts, Inc.
W77-00522

ECOLOGICAL AND PHYSIOLOGICAL PATTERNS OF POLYARTEMIA FORCIPATA (ANOSTRACA) FROM TUNDRA WATER BODIES OF THE EAST MURMAN, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
M. B. Ivanova, and E. V. Korobtsova.
Zool Zh. 53(8), p 1140-1147, 1974.

Descriptors: *Temperature, Lakes, Sampling, Tundra, *Cold regions, *Fish physiology, Ecological distribution, Distribution patterns, Oxygen.
Identifiers: *Anostraca, Bythotrephes-longimanus, Murmansk, *Polyartemia-forcipata, Russian-SFSR, USSR, Oxygen consumption(Fish), Rate of filtration(Fish).

The effect of temperature on the intensity of O2 consumption (OC) and the rate of filtration (RF) was studied in P. forcipata. The OC was determined in specimens previously adapted to the temperature of the experiment (weight, 7.1-29 mg; duration of experiment, 4-5 h). OC calculated from body weight in P. forcipata agrees well with that calculated according to Sushchenya (1972). The RF was determined by the change of concentration of silt suspension in 1.5-2 h experiments and calculated according to Gauld (1952). OC and RF, at temperatures of 5-25C, change in the same way, and the value F/Q (ml water/mg O2) is almost constant. OC and RF attain a maximum value at 15C and then decrease with a subsequent increase of temperature. The growth curve of P. forcipata in the lake (Russian SFSR, USSR) was constructed, and the energy balance for a growing specimen was calculated from samples taken in July-Aug. K2 decreases during a life span from 0.53-0.25; C/W (ration to body weight) from 21.3-8.2%; A/W (Assimilated food to body weight) from 12.8-4.9%; and R/W (metabolic expenses to body weight) from 6.2-3.7%. Bythotrephes longimanus is mentioned as a predator.--Copyright 1975, Biological Abstracts, Inc.
W77-00525

2J. Erosion and Sedimentation

ASSOCIATIONS OF CHLORINATED HYDROCARBONS WITH FINE PARTICLES AND HUMIC SUBSTANCES IN NEARSHORE SURFICIAL SEDIMENTS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W77-00086

GUIDELINES FOR SEDIMENT CONTROL IN IRRIGATION RETURN FLOW,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 5G.
W77-00090

A CONCEPTUAL MODEL OF OFFSHORE PERMAFROST,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W77-00094

GULLY DEVELOPMENT AND CONTROL: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
B. H. Heede.
USDA For. Serv. Res. Pap. RM-169, May 1976. 42 p, 36 fig, 81 ref.

Descriptors: *Gullies, *Gully erosion, *Erosion control, *Watershed protection, *Check structures, Grassed waterways, Sediment deposition, Bank protection, Riprap, Vegetation establishment, Design criteria, Structural design, Construction, History, Reviews, Bibliographies.
Identifiers: Gully mechanics, *Gully processes, *Gully growth models, *Gully control systems, Design equations, Flow-sediment relations, Gully control history.

To establish scientific management of gullies, knowledge on gully mechanics, processes and morphology must be enhanced. Even where data on flows and sediment loads are available, the application of physical laws and known theoretical relationships require engineering judgment in predicting gully development and designing control systems. Field projects indicate that simply built rock check dams can be effective control structures. Their construction, costs, and functional relationships are therefore emphasized. (Forest Service)
W77-00097

MODELING OF SOIL MOVEMENT ACROSS A WATERSHED,
Missouri Univ., Columbia. Dept. of Civil Engineering.
A. T. Hjelmfelt, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 918, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, June 15, 1976. 64 p, 19 fig, 2 tab, 17 ref. OWRT A-076-MO(1), 14-31-0001-5025.

Descriptors: Watershed management, *Erosion, Digital computers, Soils, Model studies, *Mathematical models, *Agricultural watersheds, *Sediment transport, Fluid flow, Equations, Sediment load.
Identifiers: *Kinematic wave equations.

A mathematical model for analysis of flow and soil movement across an agricultural watershed is discussed. Erosion due to rainfall on upland areas is described by the continuity-of-mass transport equation and relationships for interrill sediment detachment and the interaction between flow detachment and sediment load. The fluid flow is described by the kinematic wave equations. The flow detachment and transport capacities are taken to be power functions of the flow depth. The interrill detachment is assumed to be proportional to the effective precipitation rate. The resulting two dimensional equations describe the time-space distribution of sediment concentration and transport rate. The process for combining the results for watershed analysis is outlined.
W77-00159

ASSESSMENT OF PRACTICALITY OF REMOTE SENSING TECHNIQUES FOR A STUDY OF THE EFFECTS OF STRIP MINING IN ALABAMA,
Alabama Univ., University. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5C.
W77-00170

TRI-STATE CONFERENCE REPORT: METHODS FOR BEACH AND SAND DUNE PROTECTION,
Georgia Dept. of Natural Resources, Atlanta.
For primary bibliographic entry see Field 4D.
W77-00193

CHARCTERISTICS OF NATURALLY OCCURRING AND POLLUTANT HYDROCARBONS IN MARINE SEDIMENTS,
Paris Univ. (France).
For primary bibliographic entry see Field 5A.
W77-00223

GEOMORPHOLOGICAL MAPPING APPLIED TO SOIL EROSION EVALUATION,
National Inst. of Agricultural Engineering, Silsoe (England).
A. R. Williams, and R. P. C. Morgan.
Journal of Soil and Water Conservation, Vol. 31, No. 4, p 164-168, July-August 1976. 3 fig, 20 ref.

Descriptors: *Geomorphology, *Mapping, *Soil erosion, *Aerial photography, *Erosion, Photography, Surveys, Grassed waterways, Sediments, Accelerated erosion, Soils, Maps, Evaluation.
Identifiers: Soil erosion evaluation, Erosion patterns, Ground surveys, Natural erosion, Mapping procedure, Field surveys, Panchromatic photography.

Aerial photographs provided a base for mapping soil erosion and for evaluating soil erosion hazards. Most soil erosion features were visable indirect stereoscopic image, and those that were not, could be readily inferred from tonal variations. Compared with ground surveys, use of aerial photographs minimized the time required to produce maps and lowered the cost of surveys. However, no standard technique existed for mapping soil erosion. Different countries developed their own systems of geomorphological survey. Some common features emerged from the profusion of techniques and symbolization that existed. In addition to showing the type, intensity, and location of erosion, the authors' system portrayed information on the spatial distribution of erosivity, runoff, slope length, slope steepness, slope curvature in profile and plan, relief, soil type, and plant cover. Aerial photographs of the same area taken on different dates yielded information on temporal changes in erosion patterns for construction of empirical models. Such studies allowed the evaluation of the effects of changing land use and implementation of conservation work. (Roberts-ISWS)
W77-00369

SOME DIFFERENCES BETWEEN DISTRIBUTING AND BRAIDING CHANNELS,
Macquarie Univ., North Ryde (Australia). School of Earth Sciences.
For primary bibliographic entry see Field 2E.
W77-00376

ADJUSTMENT OF STREAM-CHANNEL SHAPE TO HYDROLOGIC REGIME,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 8B.
W77-00379

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1975,
Geological Survey, Anchorage, Alaska.
P. F. Doyle, and J. M. Childers.
Open-file report (basic data), 1975. 95 p, 52 fig, 1 tab, 4 ref, append.

Descriptors: *Channel erosion, *Construction, *Alaska, *Pipelines, Channel flow, Streams, Rivers, Data collections, Scour, Aerial photography, Photogammetry, Channel morphology.
Identifiers: *Trans-Alaska pipeline(Alas).

Channel surveys at 27 sites along the trans-Alaska pipeline route during 1975 documented significant channel changes and identified possible causative

actors. Some of the important findings of the ear's surveillance include: 8 feet (2.4 meters) of lood scour measured at the Salcha River crossing ite, 180 feet (55 meters) of lateral bank erosion neasured over 3 years on the Middle Fork Koyu-uk River near Coldfoot, and rapid shifting of nabranches on braided stream crossings during igh water. Aerial photogrammetric surveys were sed for the first time during 1975. Preliminary esults show this method is specially suited for urveillance of large braided river channels. Woodard-USGS)
W77-00433

NUTRIENT STATUS OF THE SEDIMENTS IN LAKE MULWALA, 1. TOTAL PHOSPHORUS,
Caulfield Inst. of Tech. (Australia). Dept of Chemistry.
For primary bibliographic entry see Field 5C.
W77-00450

EROSION IN 1973-74: THE RECORD AND THE CHALLENGE,
Soil Conservation Service, Washington, D. C.
C. E. Grant.
Journal of Soil and Water Conservation, Vol. 30, No. 1, p 29-32. January-February, 1975.

Descriptors: *Erosion, *Crop production, *Agriculture, *Soil conservation.

The 1973-74 growing season in many ways was not a good one for the nation's soil and water resources. Excessive soil erosion from both wind and water accompanied the efforts of many farmers to increase crop production. Contributing to the year's poor record was some of the worst weather in years. But severe erosion could also be traced to the unwise selection of certain soils for cultivated crops as well as the existence of too few conservation measures on the land. (Skogerboe-Colo St)
W77-00471

SEDIMENT DISCHARGE IN THE UPPER ARROYO GRANDE AND SANTA RITA CREEK BASINS, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. M. Knott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 422, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-64, June 1976. 29 p, 8 fig, 9 tab, 12 ref.

Descriptors: *Sediment transport, *Sediment discharge, *Sediment yield, *California, River basins, Sediment distribution, Streamflow, Sediment load, Bed load.
Identifiers: San Louis Obispo County(Calif), *Upper Arroyo Grande basin(Calif), *Santa Rita Creek basin(Calif).

Sediment data collected in the upper Arroyo Grande and Santa Rita Creek basins, San Luis Obispo County, California, during the 1968-73 water years were analyzed to determine total sediment discharge at four stations in the basins. Water discharge and total sediment discharge at these stations, representative of the 1943-72 period, were estimated from long-term flow data for nearby gaging stations and water-sediment discharge relations determined for the 1968-73 water years. Most of the total annual sediment discharge at each station occurs during a few days each year. The quantity of sediment transported in a single day often accounts for more than 40 percent of the total annual sediment discharge. Estimated sediment discharge for the upper Arroyo Grande and Santa Rita Creek basins during the 1943-72 water years averaged 53,000 tons and 23,000 tons per year. Long-term sediment deposition in Lopez Reservoir, which is in the southern part of the upper Arroyo Grande basin, was estimated to be 35 acre-feet per year. (Woodard-USGS)
W77-00487

AN OVERVIEW OF URBAN SEDIMENTOLOGY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4C.
W77-00491

QUALITATIVE COMPOSITION OF THE SUSPENDED SEDIMENTS OF THE ORDZHONIKIDZE IRRIGATION SYSTEM, (IN RUSSIAN),
T. A. Mamedova.
Izv Akad Nauk Az SSR Ser Biol Nauk. 4, p 53-57, 1974.

Descriptors: Irrigation systems, *Turbidity, *Suspended solids, *Particle size, *Nutrients, *Water quality, *Sierozems, *Fertilization, Canals, *Irrigation canals, *Sediments, Irrigation water, Distribution.
Identifiers: Ordzhonikidze canal(USSR), *USSR.

The Ordzhonikidze canal in the Azerbaijan SSR (USSR) originates from the Araks River and runs 64 km southwestward through the Mil'skii steppe, irrigating an area of 73,000 ha. Data are presented on the turbidity of the irrigation waters and particle-size distribution and chemical composition of the suspended sediments of the system. The suspended sediments of the system are nutrient rich and play an important role in the fertility of the irrigated sierozem soils.—Copyright 1975, Biological Abstracts, Inc.
W77-00497

STUDY OF THE EROSION STABILITY OF THE PLOW LAYERS OF GRAY FOREST SOILS OF THE NORTHERN FOREST-STEPPE, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 4D.
W77-00514

2K. Chemical Processes

DYNAMICS OF THE COMPOSITION AND THE QUALITIES OF WATER-SOLUBLE ORGANIC SUBSTANCE DURING THE COMPOSTING OF CLOVER AND TIMOTHY ROOTS, (IN RUSSIAN),
Leningrad State Univ. (USSR)
For primary bibliographic entry see Field 5B.
W77-00062

RETENTION OF ARSENIC BY HYDROXY-ALUMINUM ON SURFACES OF MICACEOUS MINERAL COLLOIDS,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-00283

A PROCEDURE FOR THE SAMPLING AND TESTING OF LARGE SOIL CORES,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W77-00286

CHEMICAL WEATHERING OF GLAUCONITE,
Tripoli Univ., Libya. Dept. of Soil and Water Sciences.
G. Abudelgawad, A. L. Page, and L. J. Lund.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 567-571, May-June 1975. 3 fig, 2 tab, 26 ref.

Descriptors: *Chemical reactions, *Geologic investigations, Geological surveys, Geochemistry, Sampling, Limestone, X-ray diffraction, Mineralogy.
Identifiers: *Glauconite, *Chemical weathering, Barce Plateau(Libya).

Glauconite samples were collected from geologic cuts in the Barce Plateau in the eastern part of Libya. The glauconite was associated with limestone, dolomitic limestone, marl, marl stone, chert, and kaolinite. Samples of the glauconite from the area of study after removal of carbonates gave X-ray diffraction spacings of 10.0, 7.2, 5.0, 3.6 and 3.3 Angstroms. Spacings of 10.0, 5.0, and 3.3 Angstroms represent the 001, 002, and 003 reflection of micaceous components. Spacings of 7.2 and 3.6 Angstroms were due to kaolinite. No 060 reflection was observed for random samples. The absence of this spacing, although not entirely specific for glauconite, is indicative of glauconite-like minerals. Petrographic analysis and chemical composition confirmed that the micaceous mineral studied was glauconite. (Skogerboe-Colo St)
W77-00289

THE ACTIVITY CONCEPT OF PHOSPHATE-ROCK SOLUBILITY,
International Fertilizer Development Center, Florence, Ala.
S. H. Chien, and C. A. Black.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 856-858, September-October 1975. 4 fig, 11 ref.

Descriptors: *Phosphates, *Soil chemistry, Soil investigations, Chemical reactions, Florida, Geochemistry.
Identifiers: *Phosphorite, *Florida phosphate rock.

Variously treated samples of a finely ground Florida phosphate rock were equilibrated with dilute HCl solutions, and the ion-activity product of the carbonate apatite mineral in the phosphate rock was then determined from analyses made on the solutions. Constant ion-activity products or solubility-product constants were found within a certain pH range in each instance. The solubility, as reflected by the numerical value of the constant, decreased with an increase in the proportion of the phosphate rock dissolved in the solubility determination or prior thereto. After a certain portion of the phosphate rock had been dissolved, however, no further decrease in solubility was found with further extraction of the phosphate rock. These results are similar to those obtained previously with synthetic hydroxyapatite and were interpreted in the same way, namely, that the solids are not uniform but exist in a range of activities. (Skogerboe-Colo St)
W77-00290

THE MECHANISM OF PHOSPHATE FIXATION BY IRON OXIDES,
Griffith Univ., Nathan, (Australia).
R. L. Parfitt, R. J. Atkinson, and R. St. C. Smart.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 837-841, September-October 1975. 6 fig, 1 tab, 12 ref.

Descriptors: *Iron oxides, *Iron, *Phosphates, Soil chemistry, Soil investigations, Chemical reactions, Infrared spectroscopy, Geochemistry.
Identifiers: *Infrared spectroscopy, *Phosphate fixation.

Infrared spectroscopic techniques have been used to obtain a structural model for the surface reaction between iron oxides and phosphate ions. Two surface hydroxyl ions (or water molecules) are replaced by one phosphate ion. Two of the oxygen atoms of the phosphate ion are coordinated, each to a different Fe^{3+} ion, resulting in a binuclear surface complex of the type Fe-O-P(O2)-O-Fe. Evidence is given for phosphate adsorption

producing this coordination structure on the surfaces of goethite, hematite, lepidocrocite, beta-ferric hydroxide, and amorphous ferric hydroxide gel. (Skogerboe-Colo St)
W77-00291

DENITRIFICATION RATES IN RELATION TO TOTAL AND EXTRACTABLE SOIL CARBON,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 2G.
W77-00294

SODIUM AVAILABILITY IN NONALKALI SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-00296

TOTAL NITROGEN USING A SODIUM HYDROXIDE INDEX AND DOUBLE SAMPLING THEORY,
Forest Service (USDA), La Grande, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W77-00297

A NEW TECHNIQUE FOR RAPID AND CONTINUOUS MEASUREMENT OF REDOX POTENTIALS,
Lockheed Missiles and Space Co., Sunnyvale, Calif.
For primary bibliographic entry see Field 2G.
W77-00299

USE OF AMMONIA ELECTRODE FOR DETERMINATION OF CATION EXCHANGE CAPACITY IN SOIL STUDIES,
Iowa State Univ., Ames. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-00300

THE IMPACT OF MAN ON THE WORLD NITROGEN CYCLE,
Purdue Univ., Lafayette. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5A.
W77-00312

THE SPECTROPHOTOMETRIC DETERMINATION OF ARSENIC IN SEA WATER, POTABLE WATER, AND EFFLUENTS,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-00319

RE-ASSESSMENT OF CHELATING ION-EXCHANGE RESINS FOR TRACE METAL ANALYSIS OF SEA WATER,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-00320

THE DETERMINATION OF ZINC, CADMIUM, LEAD AND COPPER IN A SINGLE SEA-WATER SAMPLE BY DIFFERENTIAL PULSE ANODIC STRIPPING VOLTAMMETRY,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-00321

STATE OF WISCONSIN AUTOMATIC WATER QUALITY MONITORING SYSTEM FOR THE FOX AND WISCONSIN RIVERS,
Wisconsin Dept. of Natural Resources, Wisconsin Rapids.
For primary bibliographic entry see Field 5A.
W77-00334

CHEMILUMINESCENCE METHOD OF DETERMINING COPPER IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5A.
W77-00404

HYDROGEOCHEMICAL INVESTIGATION OF THE DANUBE WATER IN AUSTRIA DURING THE YEARS 1971 AND 1972, (IN GERMAN),
Bundesversuchs- und Forschungsanstalt Arsenal, Vienna (Austria).
For primary bibliographic entry see Field 5A.
W77-00406

SUITABILITY OF CONTAINERS FOR STORAGE OF WATER SAMPLES,
Australian Mineral Development Labs., Adelaide.
For primary bibliographic entry see Field 5A.
W77-00436

STOICHIOMETRIC DISTANCE AND TOTAL CONCENTRATION: A BINARY NUMERICAL DESCRIPTION OF INLAND WATER CEHMISTRY,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
R. T. Buckney.
Australian Journal of Marine and Freshwater Research, Vol. 27, No. 1, p 73 - 81, March 1976. 7 fig., 21 ref.

Descriptors: *Data processing, *Water chemistry, *Ions, *Surface waters, *Australia, Analytical techniques, Salinity, Hydrogen ion concentration, Silica, Potassium, Sodium, Calcium, Magnesium, Chlorides, Sulfates, Carbonates, Pollutant identification.
Identifiers: *Tasmania.

A method is presented by which analytical data for major ions in water may be simply presented by means of two parameters - a 'total concentration' parameter based on the total anion equivalent concentration, and a 'stoichiometric distance' parameter which expresses the relative concentrations of the major ions in the water by reference to the relative ion composition of seawater. The ions considered are those of potassium, sodium, calcium and magnesium; chloride, sulfate and carbonate-bicarbonate. The system is used to describe some features of inland waters of Tasmania (Australia), and equilibrium and other controls on pH and silica concentration are noted. Since this particular analysis is based on the observed range of ionic proportions in Tasmania, its conclusions may not be directly applicable elsewhere; but it has facilitated the identification of features which might occur more widely. (CSIRO)
W77-00449

HYDROGEOCHEMISTRY OF THE GENOA RIVER BASIN, NEW SOUTH WALES - VICTORIA (AUSTRALIA),
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Environmental Marine Geology.
G. E. Reinson.
Australian Journal of Marine and Freshwater Research, Vol 27, No 1, p 165-186, March 1976. 9 fig, 5 tab, 22 ref.

Descriptors: *Granites, *Weathering, *River basins, *Water chemistry, *Australia, Rock properties, Water types, Salinity, Watersheds(Basins), Calcium, Magnesium, Sodium, Bicarbonates, Chlorides, Salt balance, Surface waters, Pollutant identification.
Identifiers: Genoa River(NSW-Vic).

Two main chemical types of surface water are identified within the basin: a sodium-chloride type and a mixed-cation chloride-bicarbonate type. The genesis of the types is related to differences in the weathering rates of the granitoid rocks underlying the basin. Readily weathered rock suites yield minerals which supply calcium, magnesium, sodium and bicarbonates to the water draining them (mixed cation type), while where chemical rock weathering is slow, the surface water chemistry is dominated by atmospheric salts (sodium chloride type). This difference remains the controlling factor in the genesis of the two water types even during low runoff periods when the groundwater contribution to streamflow and the rate of evaporation are high. (CSIRO)
W77-00452

IDENTIFICATION AND ANALYSIS OF ORGANIC POLLUTANTS IN WATER.
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-00455

2L. Estuaries

CAPACITY OF A SPARTINA SALT MARSH TO ASSIMILATE NITROGEN FROM SECONDARILY TREATED SEWAGE,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5B.
W77-00003

ENGINEERING STUDY AND FIELD DEMONSTRATION TRIALS FOR SAND DUNE STABILIZATION,
Ward (George D.) and Associates, Portland, Oreg.
For primary bibliographic entry see Field 5E.
W77-00032

ASSOCIATIONS OF CHLORINATED HYDROCARBONS WITH FINE PARTICLES AND HUMIC SUBSTANCES IN NEARSHORE SURFICIAL SEDIMENTS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W77-00086

A CONCEPTUAL MODEL OF OFFSHORE PERMAFROST,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W77-00094

TRIESTE–WATER LEVELS 1952-1971; A STUDY OF THE TIDE, MEAN LEVEL, AND SEICHE ACTIVITY,
Department of the Environment, Ottawa (Ontario). Marine Environmental Data Service.
G. Godin, and L. Trotti.
Miscellaneous Special Publication 28, 1975. 24 p, 17 fig, 14 tab, 29 ref.

Descriptors: *Water levels, *Tides, *Variability, *Seiches, Waves, Gaging stations, Gages, Measurement, Data processing, Analytical techniques, Fourier analysis, Sampling, Estuaries, Harbors, Oceanography.
Identifiers: *Trieste, *Italy.

A sequence of observations on the water level at Trieste covering the interval 1952-71 was submitted to a general analysis. The sequence was divided into sub-sequences of observations of a duration of 355 days to follow the evolution of these sub-sequences. Three factors affected the water level at Trieste: (1) the tide, (2) slow variations, and (3) transient oscillations due to storms which were made evident by seiches or sudden jumps in

. The study of the tide was effected with the of sample Fourier spectra, which aided recog- n and identification of the tidal constituents. identification was checked by the evolution e Greenwich phase lag from sample to sam- If it showed a long-term trend, the identifica- of the constituent was erroneous, and it was ssary to search for a similar or neighboring tituent which could explain the same peak. A r reliable list of constituents of the tide at Tri- was set up which seemed to vary little from to year. An increase in the phases during 3 ecutive years could be attributed to a gradual uction of the stilling well. On the other hand, nean level, obtained from a low-pass filter, ed strong and often prolonged variations dur- he fall and winter and yielded to an explana- only after a deeper study of their physical es. Power spectra of the same low passes computed with the hope that they would help in this type of variation. The difference een the observed level and the predicted tide e up what is calleda 'residue': it reflected all henomena which did not have the regularity e tide. The plot of these residues from month onth allowed a rapid inspection of all that ed to exceed the norms, and the months dur- which important transients occurred were set e for a closer look. In this way, incidents of lation caused by the great Adriatic seiche of a d of 22 h, very near to that of the diurnal tide, abrupt changes in level caused by a rapid sition from a regime of sirocco to the bora or frontal passage could be isolated. (Sims- S)
-00128

MERICAL SIMULATION OF THE ARCTIC EAN CIRCULATION,
fornia Univ., Los Angeles. Dept. of eorology.
Semtner, Jr.
nal of Physical Oceanography, Vol. 6, No. 4, p 425, July 1976. 22 fig, 2 tab, 35 ref.

criptors: *Model studies, *Ocean circulation, ctic Ocean, *Mathematical models, Water cir- tion, Oceans, Winds, Temperature, Water perature, Salinity, Atmospheric pressure, Cur- s(Water), Circulation, Simulation analysis, anography.
ntifiers: *Greenland Sea.

circulation of the Arctic Ocean and Greenland was simulated using the 1969 numerical model Bryan and Cox. The coastline and bottom graphy of the region were resolved by a 110 horizontal grid spacing and by 14 vertical ls. The transfers of mass, heat, and momen- at the ocean surface and at open lateral boun- es were specified from observations. In par- lar, the pattern of wind stress was obtained g a map of mean annual atmospheric pressure; a scalar multiplier was applied to account for nonlinear dependence of stress on wind speed. ee experiments with different values of this ar multiplier were run to simulate the effect of , medium, and low wind stress. Many of the erved features of the Arctic circulation were oduced by the simulation. The observed fea- s were: the Greenland Sea exhibits cyclonic at all levels and deep convection in its central on. The Beaufort Sea shows anti-cyclonic flow ne surface and a stble stratification maintained halocline. The Arctic Ocean receives bottom er and an intermediate layer of warm Atlantic er through the Greenland-Spitsbergen Passage, its exports surface water of low salinity into ntense East Greenland Current. The sense of ulation of the Atlantic layer in the central Arc- Ocean, although opposite to that usually in- ed from water mass properties, seems to be in onable agreement with existing direct current surements. (Sims-ISWS)
7-00129

ON FORCED, LONG CONTINENTAL SHELF WAVES ON AN F-PLANE,
Oregon State Univ., Corvallis. School of Oceanography.
J. S. Allen.
Journal of Physical Oceanography, Vol. 6, No. 4, p 426-431, July 1976. 5 ref. NSF DES75-15202, NSF IDO71-04211, NSF OCE76-00596.

Descriptors: *Model studies, *Ocean waves, *Continental shelf, *Continental slope, Waves(Water), Ocean circulation, Mathematical models, Coriolis force, Fluid mechanics, Shores, Coasts, Internal waves, Mathematics, Equations, Computer models, Oceanography.
Identifiers: *Continental shelf waves, f-Plane waves.

Previous studies of forced, long continental shelf waves on an f-plane have considered motion on the shelf and slope which is driven by an alongshore component of the wind stress, essentially through the suction of fluid into the surface layer at the coast. These studies have utilized a boundary condition, which arises consistently in the longwave nondispersive limit for free shelf waves, that at the slope-interior junction the alongshore velocity component is approximately equal to zero. This is an extremely useful condition for problems concerning forced motion on the shelf and slope because it completely uncouples the motion in this region from that in the interior, and it allows the shelf-slope problem to be solved independently of the interior problem. It was shown, however, that this condition is not correct in general for wind-stress-forced f-plane motion. A proper formulation of the f-plane, forced shelf wave problem in the long wave limit was presented. The motion on the shelf and slope, in general, was coupled with and forced by the flow in the interior. (Sims-ISWS)
W77-00131

THE TRANSMISSION AND DECAY OF BAROTROPIC TOPOGRAPHIC ROSSBY WAVES INCIDENT ON A CONTINENTAL SHELF,
Nova Univ., Fort Lauderdale, Fla.
J. Kroll, and P. P. Niiler.
Journal of Physical Oceanography, Vol. 6, No. 4, p 432-450, July 1976. 21 fig, 10 ref. NSF GA-34149.

Descriptors: *Model studies, *Ocean waves, *New England, *Florida, *Continental shelf, Waves(Water), Ocean circulation, Mathematical models, Coriolis force, Fluid mechanics, Shores, Coasts, Topography, Mathematics, Equations, Computer models, Oceanography.
Identifiers: *Continental shelf waves, Barotropic waves, Topographic waves, Rossby waves.

It is known that long-period (greater than 1 day) and long-wavelength (greater than 100 km) topographical Rossby waves can be generated by a wind acting directly on a continental shelf. The characteristics of these waves, which can also be produced off the shelf by wind and current eddies and can propagate up to and onto the shelf, were examined. A shelf model was used which varied in depth in one direction only, and it was assumed that a shelf can be approximated by at most two breaks with the depth varying exponentially. Also assumed was velocity-dependent bottom friction to determine the effect of frictional dissipation. The following results were derived: The regression angle of scatter plots for topography-dominated waves should be small, and the preponderant direction of the waves determined by the sign. The group velocity directed up the slope possesses an absolute maximum which occurs at a relatively short period. The ability of a wave moving up a slope to overcome friction correlates with this group velocity. The energy flux transmission across one and two breaks can be determined. It was suggested that the product of this flux transmission coefficient and the group velocity component up the shelf be the criterion to determine which wavelengths and frequencies penetrate nearest to shore. It was found, however, that the energy from off the shelf is likely to be decayed completely in bottom depths less than about 25 m. A comparison of some results with data for the New England and west Florida shelf showed a general agreement. (Sims-ISWS)
W77-00132

CONTINENTAL SHELF WAVES IN THE FLORIDA STRAITS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
F. Schott, and W. Duing.
Journal of Physical Oceanography, Vol. 6, No. 4, p 451-460, July 1976. 8 fig, 3 tab, 19 ref, 3 append. ONR N0001475-C-0173.

Descriptors: *Ocean waves, *Continental shelf, *Currents(Water), *Florida, Topography, Water circulation, Ocean circulation, Waves(Water), On-site investigations, Current meters, Data processing, Analytical techniques, Wavelengths, Oceanography.
Identifiers: *Florida Straits, *Gulf Stream, Continental shelf waves, Barotrophic waves, Wave propagation.

Current measurements from three stations along the east coast of Florida at about 300 m water depth with a maximum longshore separation of 180 km were used to analyze for the presence of propagating waves. The analysis was done by solving the inverse problem of determining the most likely wave parameters from 36 independent auto spectra and cross spectra from four current meters. For the 10-13 day band, a significant fit of the data by wave cross-spectral function was found. The wavelength was 170 km and the phase propagation 17 cm/s toward the south. The current fluctuations were elliptically polarized with anticyclonic rotation and with an axis ratio of 0.30. The mean current amplitude was 14.3 cm/s. A marginally significant fit with similar wave parameters resulted for the 7-10 day band. The results suggested that these waves were continental shelf waves, probably generated by atmospheric cold front passages. (Sims-ISWS)
W77-00133

ON THE FLOW THROUGH BARROW CANYON,
Washington Univ., Seattle. Dept. of Oceanography.
D. G. Mountain, L. K. Coachman, and K. Aagaard.
Journal of Physical Oceanography, Vol. 6, No. 4, p 461-470, July 1976. 12 fig, 1 tab, 9 ref. ONR N00014-67-A-0103-0014, ONR N00014-A-0103-0021.

Descriptors: *Flow, *Ocean currents, *Alaska, *Arctic Ocean, Surveys, Measurement, Current meters, Temperature, Salinity, Winds, Model studies, Mathematical models, Dynamics, Fluid mechanics, Oceanography.
Identifiers: *Barrow Canyon, *Bering Strait, *Chukchi Sea.

Simultaneous current and temperature measurements were made at two depths in Barrow Canyon for a period of 120 days from April through August, 1973. The mean of the measured currents was 25 cm/s toward the northeast, such that water moved out of the canyon from the Chukchi Sea toward the Arctic Ocean. The measurements, however, were characterized by higher speeds, commonly in excess of 50 cm/s, and large variations which resulted in periods of reversed (southwest) up-canyon motion. During these reversed flow periods, increased temperature indicated the presence in the canyon at 126 m depth of Atlantic water from 200-300 m depth in the Arctic Ocean. A close relationship existed between the measured currents and the north-south atmospheric pressure gradient, such that when the

pressure rose to the north, the northward flow of water through the canyon decreased. A simple dynamic model was presented to account for the observed current-pressure relationship. (Sims-ISWS)
W77-00134

GEOGRAPHICAL VARIABILITY OF THE INTERNAL WAVE FIELD: A SEARCH FOR SOURCES AND SINKS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
C. Wunsch.
Journal of Physical Oceanography, Vol. 6, No. 4, p 471-485, July 1976. 13 fig, 20 ref. ONR N00014-75-C-0291, NSF IDO75-03998.

Descriptors: *Internal waves, *Atlantic Ocean, *Ocean waves, On-site investigations, Surveys, Current meters, Data processing, Analytical techniques, Topography, Bathymetry, Equations, Energy, Dynamics, Waves(Water), Ocean currents, Currents(Water), Model studies, Mathematical models, Oceanography.
Identifiers: *Muir Seamount, *Gulf Stream.

Internal wave records from a variety of deep water locations in the North Atlantic have been reduced by common analysis methods in a search for systematic deviations from a universal spectral model. It was speculated that such inhomogeneities are probably necessary conditions for sources and sinks of the motion. For a number of reasons, only records at 2000 m and below were used. Real variations in energy level of up to an order of magnitude were found, but the only clear inhomogeneities were associated with bottom topography, especially in those records obtained near Muir seamount. The effects, if any, on the internal wave field by the large velocity and shear of the Gulf Stream region were weak. Apparent topographic sources were inconspicuous at very short distances, suggesting a very rapid, nonlinear recovery of the spectrum to an equilibrium form. (Sims-ISWS)
W77-00135

DETERMINATION OF LAGRANGIAN DEFORMATIONS FROM ANALYSIS OF CURRENT FOLLOWERS,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
A. Okubo, C. C. Ebbesmeyer, and J. M. Helseth.
Journal of Physical Oceanography, Vol. 6, No. 4, p 524-527, July 1976. 10 ref. NOAA 6108A, ONR N-00014-67-A-0103-0014.

Descriptors: *Data processing, *Analytical techniques, *Currents(Water), Drift bottles, Deformation, Velocity, Water circulation, Oceans, Mathematical studies, Current meters, Equations, Oceanography.
Identifiers: *Lagrangian deformations.

Methods were presented to determine Lagrangian deformations and turbulence statistics from current followers (drogues, neutrally buoyant floats, etc.). Such determinations allowed general advection-diffusion equations to be directly evaluated. Methods were also presented to transform these deformations into oceanic velocity gradients. (Sims-ISWS)
W77-00136

SEA SURFACE TEMPERATURE FLUCTUATIONS AT TIDAL FREQUENCIES AT WEATHER SHIPS CHARLIE AND DELTA,
McGill Univ., Montreal (Quebec).
T. Jakobsson.
Journal of Physical Oceanography, Vol. 6, No. 4, p 602-605, July 1976. 2 fig, 1 tab, 13 ref.

Descriptors: *Water temperature, *Atlantic Ocean, *Tidal effects, *Weather data, Temperature, Oceans, Tides, Stations, Fluctuations, Frequency, Internal waves, Topography, Data processing, Frequency analysis, Oceanography.
Identifiers: *Sea surface temperature, Spectral analysis.

Data consisting of three years of 3 h surface observations at North Atlantic ocean weather stations Charlie and Delta were analyzed by spectral analysis. Sea surface temperature variations at higher frequencies were examined in detail and some related to tidal frequencies. These occurred at Charlie. The absence of similar fluctuations at Delta was explained by the station's proximity to an amphidromic point in the North Atlantic tidal system. (Sims-ISWS)
W77-00137

TEMPERATURE-SALINITY CURVES IN THE PACIFIC AND THEIR APPLICATION TO DYNAMIC HEIGHT COMPUTATION,
Hawaii Univ., Honolulu. Dept. of Oceanography.
W. J. Emery, and R. T. Wert.
Journal of Physical Oceanography, Vol. 6, No. 4, p 613-617, July 1976. 3 fig, 8 ref.

Descriptors: *Temperature, *Salinity, *Pacific Ocean, *Oceans, Water properties, Chemical properties, Sea water, Water temperature, Physical properties, Hydrography, Oceanography.
Identifiers: *Temperature-salinity curves, *Temperature-salinity dynamic height.

Mean temperature-salinity (TS) curves were computed from all available hydrographic data from 10 deg quadrangles in the Pacific between 20 deg S and 40 deg N. These curves, together with temperature profiles from hydrographic stations, were used to compute a quantity called TS dynamic height. The rms differences between dynamic and TS dynamic height indicated where mean TS curves might be reliably used to compute dynamic height from temperature profiles. (Sims-ISWS)
W77-00138

A FOUR-YEAR ANALYSIS OF VEGETATION FOLLOWING AN OIL SPILL IN A FRESHWATER MARSH,
Smith Coll., Northampton, Mass. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-00147

SURFACE NUTRIENTS, CHLOROPHYLL-A AND PHAEOPIGMENT IN SOME SCOTTISH SEA LOCHS,
Dunstaffnage Marine Research Lab., Oban (Scotland).
For primary bibliographic entry see Field 5C.
W77-00182

COMPOSITIONAL CHANGES OF A FUEL OIL FROM AN OIL SPILL DUE TO NATURAL EXPOSURE,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5B.
W77-00183

EFFECTS OF OIL ON THE REPRODUCTION OF THE AMPHIPOD GAMMARUS OCEANICUS,
Swedish Water and Air Pollution Research Lab., Nykoping. Baltic Sea Lab.
For primary bibliographic entry see Field 5C.
W77-00188

TRI-STATE CONFERENCE REPORT: METHODS FOR BEACH AND SAND DUNE PROTECTION,
Georgia Dept. of Natural Resources, Atlanta.
For primary bibliographic entry see Field 4D.
W77-00193

THE BENTHIC ECOLOGY OF LOCH LINNHE AND LOCH EIL, A SEA-LOCH SYSTEM ON THE WEST COAST OF SCOTLAND. IV. CHANGES IN THE BENTHIC FAUNA ATTRIBUTABLE TO ORGANIC ENRICHMENT,
Dunstaffnage Marine Research Lab., Oban (Scotland).
For primary bibliographic entry see Field 5C.
W77-00196

LOS ANGELES HARBOR FIELD INVESTIGATION OF OIL AND BACKGROUND LUMINESCENCE SIGNATURES,
McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
For primary bibliographic entry see Field 5A.
W77-00197

THE USE OF ERTS-1 TO MORE FULLY UTILIZE AND APPLY MARINE STATION DATA TO THE STUDY AND PRODUCTIVITY ALONG THE EASTERN SHELF WATERS OF THE UNITED STATES,
Old Dominion Univ. Research Foundation, Norfolk, Va.
For primary bibliographic entry see Field 5A.
W77-00198

REMOTE SAMPLER FOR DETERMINING RESIDUAL OIL CONTENT OF SURFACE WATERS,
Naval Ship Research and Development Center, Annapolis, MD.
For primary bibliographic entry see Field 5A.
W77-00216

OIL SPILL-SOURCE CORRELATION BY GAS CHROMATOGRAPHY: AN EXPERIMENTAL EVALUATION OF SYSTEM PERFORMANCE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W77-00218

THE ISOLATION AND CHARACTERIZATION OF HYDROCARBON-UTILIZING BACTERIA FROM CHEDABUCTO BAY, NOVA SCOTIA,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
For primary bibliographic entry see Field 5A.
W77-00244

PREDICTION OF OIL SLICK MOTIONS IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Dept. of Mechanical Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5B.
W77-00253

CODES OF PRACTICE FOR DEALING WITH OIL SPILLS AT SEA AND ON SHORE: A EUROPEAN VIEW
Institute of Petroleum, London (England).
For primary bibliographic entry see Field 5G.
W77-00262

USE OF THE MASSACHUSETTS DIP OIL SKIMMER ON FREE SLICKS IN THE CASCO BAY (PORTLAND) SPILL,
JBF Scientific Corp., Burlington, Mass.
For primary bibliographic entry see Field 5G.
W77-00265

A STUDY OF THE EFFECTS OF THE SAN FRANCISCO OIL SPILL ON MARINE ORGANISMS,
College of Marin, Kentfield, Calif.
For primary bibliographic entry see Field 5C.
W77-00270

HE PHYSICAL OCEANOGRAPHY AND ATER QUALITY OF NEW YORK HARBOR ND WESTERN LONG ISLAND SOUND,
ate Univ. of New York at Stony Brook. Marine iences Research Center.
r primary bibliographic entry see Field 5G.
77-00273

HROMOSOME MUTAGENESIS IN DEVELOP-G MACKEREL EGGS SAMPLED FROM THE EW YORK BIGHT,
ational Oceanic and Atmospheric Administra-n, Boulder, Colo. Marine Ecosystems Analysis ogram Office.
r primary bibliographic entry see Field 5C.
77-00274

OASTAL ZONE BIBLIOGRAPHY: CITA-ONS TO DOCUMENTS ON PLANNING, ESOURCES MANAGEMENT AND IMPACT SSESSMENT, SECOND EDITION,
lifornia Univ., San Diego, La Jolla. Inst. of arine Resources.
Jenks, J. Sorensen, and J. Breadon.
a Grant Publication No. 49, IMR Ref. No. 76-8, ne 1976. 174 p, 1701 ref. NOAA Sea Grant 04-5-8-20.

escriptors: *Coasts, *Bibliographies, *Estuaries, esources development, *Coastal marshes, nvironmental effects, Management, Planning, ater resources, Land use, Conservation.
entifiers: *Coastal zone management, nvironmental impact.

is second edition of the bibliography contains 01 references to publications dealing with ources management and impact assessment of coastal zone. The documents which have been luded are primarily monographs. Only a few rnal or periodical articles have been included. OAA)
77-00277

ITED STATES COAST PILOT 4 - ATLANTIC OAST FROM CAPE HENRY TO KEY WEST.
tional Ocean Survey, Rockville, Md.
r primary bibliographic entry see Field 4A.
77-00278

ITED STATES COAST PILOT 5 - ATLANTIC OAST FROM GULF OF MEXICO, PUERTO CO, AND VIRGIN ISLANDS,
tional Ocean Survey, Washington, D.C.
r primary bibliographic entry see Field 4A.
77-00279

FECTS ON COMMERCIAL FISHING OF TROLEUM DEVELOPMENT OFF THE RTHEASTERN UNITED STATES,
oods Hole Oceanographic Institution, Mass. rine Policy and Ocean Management Program.
r primary bibliographic entry see Field 5C.
7-00280

LORINATED HYDROCARBON PESTICIDES WESTERN NORTH ATLANTIC OCEAN,
rth Carolina Univ. at Chapel Hill. Dept. of En-onmental Sciences and Engineering.
r primary bibliographic entry see Field 5B.
7-00325

EBSIELLA DENSITIES IN WATERS CEIVING WOOD PULP EFFLUENTS,
vironmental Protection Agency, Dauphine nd, Ala. Gulf Coast Water Supply Research .
primary bibliographic entry see Field 5C.
7-00337

BIBLIOGRAPHY ON TIDAL HYDRAULICS, SUPPLEMENTARY MATERIAL COMPILED FROM MAY 1971 TO MAY 1974, ES 816, TIDAL FLOWS IN RIVERS AND HARBORS.
Committee on Tidal Hydraulics (Army), Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A013 082, Price codes: A11 in paper copy, A01 in microfiche. Report No. 2, Supplement No. 7, June 1975. 241 p.

Descriptors: *Information exchange, *Reviews, *Publications, *Bibliographies, Theoretical analysis, Sedimentation, Water pollution, Regulation, Salinity, Laboratory tests, Instrumentation, Surveys, Surveying instruments, Data collections, Tidal streams, Tidal waters, Hydraulics, Tides, Estuaries, Currents(Water).

The bibliography consisted of 670 references divided into eight sections: (1) theoretical considerations, (2) sedimentation, (3) salinity effects, (4) contamination, (5) regulation and improvement, (6) laboratory experiments, (7) surveys and instruments, and (8) basic physical data. The references were arranged alphabetically by authors' names within each section, and all references were annotated. Copies of the papers listed are available through loan within the continental United States. (Froehlich-ISWS)
W77-00353

SEABED DRIFTER MOVEMENT IN SAN DIEGO BAY AND ADJACENT WATERS,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5B.
W77-00356

PROJECT FOG DROPS V - TASK I: A NUMERICAL MODEL OF ADVECTION FOG, TASK II: RECOMMENDATIONS FOR SIMPLIFIED INDIVIDUAL ZERO-GRAVITY CLOUD PHYSICS EXPERIMENTS,
Calspan Corp., Buffalo, N. Y.
For primary bibliographic entry see Field 2B.
W77-00357

COLIFORM BACTERIA FROM DIFFUSE SOURCES AS A FACTOR IN ESTUARINE POLLUTION,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W77-00359

VERTICAL DIFFUSION DRIVEN BY INTERNAL WAVES IN A SILL FJORD,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
A. Strigebrandt.
Journal of Physical Oceanography, Vol. 6, No. 4, p 486-495, July 1976. 5 fig, 1 tab, 8 ref, append.

Descriptors: *Fjords, *Tides, *Mixing, *Internal waves, Model studies, Hydraulic models, Salinity, Saline water-freshwater interfaces, Froude number, Tidal waters, Seiches, Equations, Flow, Waves(Water), Estuaries, Path of pollutants.
Identifiers: *Norway, *Oslofjord(Norway), Sill fjord, Richardson number.

A new mechanism, the breaking of internal waves, was proposed to explain vertical mixing within the lower layers of sill fjords. The generation of the waves at the sill of a fjord was modelled, assuming constant depth except at the narrow sill whose height was the thickness of the lower layer. A barotropic tide oscillating across the sill created internal waves which propagated both seaward and landward from the sill. These waves broke against the bottom, creating boundary turbulence which mixed water of different density in the lower layer. This was demonstrated experimentally. The mixture flowed away from the boundaries into the interior of the fjord, causing an effective vertical mixing. The energy input into the internal waves and the damping of barotropic seiches were computed using linear theory. Possible instability, except at the bottom, was discounted by considering representative Richardson and Froude numbers. The theory was then qualitatively applied to the Oslofjord with particular attention given to the effects caused by changing the sill geometry. An estimate of the Richardson flux number from the Oslofjord data gave a value of 0.05. ((Sims-ISWS)
W77-00360

CLIMATOLOGICAL NUMERICAL MODELS OF THE SURFACE MIXED LAYER OF THE OCEAN,
Woods Hole Oceanographic Institution, Mass.
R. O. R. Y. Thompson.
Journal of Physical Oceanography Vol. 6, No. 4, p 496-503, July 1976. 7 fig, 16 ref. ONR N00014-74-C-0262-NR-083-004.

Descriptors: *Model studies, *Oceans, *Water temperature, *Pacific Ocean, Mathematical models, Forecasting, Temperature, Mixing, Thermocline, Climatology, Oceanography.
Identifiers: *Surface mixed layer, *Ocean Weather Station N(Pacific Ocean).

Three slab models of the surface mixed layer of the ocean were given simple and fast computer implementations. Actual meteorological data from Ocean Weather Station N were used for a year-long forecast. The results compared quite well with the observations of vertical temperature profiles, with correlations up to 0.98 between predicted and observed sea-surface temperatures and of 0.8 between predicted and observed mixed-layer depths. Temperature anomalies introduced in the spring can be covered up in the summer, yet reappear in the winter. A constant-thickness slab was suitable as a lower boundary for some atmospheric climatological studies if a depth of 25 m was used. The model based on a Froude number criterion worked best for the available data set; this was physically appealing since the model contained no adjustable parameters. (Sims-ISWS)
W77-00361

THE ROLE OF SURFACE MIXING IN THE SEASONAL VARIATION OF THE OCEAN THERMAL STRUCTURE,
Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
R. L. Haney, and R. W. Davies.
Journal of Physical Oceanography, Vol. 6, No. 4, p 504-510, July 1976. 7 fig, 1 tab, 16 ref. ONR N00014-76-WR-60020.

Descriptors: *Model studies, *Oceans, *Water temperature, *Pacific Ocean, Mathematical models, Temperature, *Mixing, Seasonal, Equations, Heat transfer, Climatology, Oceanography, Meteorology.
Identifiers: *Ocean Weather Station N(Pacific Ocean).

The role of surface-generated mixing in determining the seasonal variation of the ocean thermal structure was investigated using a one-dimensional numerical model. The model contained vertical eddy diffusion with a constant coefficient K sub H = 0.5 sq cm/s, an instantaneous convective adjustment mechanism as commonly used in oceanic general circulation models, and a simple parameterization of surface-generated wind and convective mixing based on recent mixed-layer theories. Forcing on the seasonal time scale was accomplished by prescribing the atmospheric solar radiation, long-wave radiation, wind speed, temperature, and dew point to vary sinusoidally with the annual period. Results of model integrations showed that surface-generated wind and convective mixing were responsible for producing many features which were observed in the real ocean, in-

cluding the occurrence of two sea surface temperature maximai-one in summer and another in early fall. (Sims-ISWS)
W77-00362

SALT FINGERS OBSERVED IN THE MEDITERRANEAN OUTFLOW REGION (34 N, 11 W) USING A TOWED SENSOR,
Massachusetts Inst., of Tech., Cambridge. Dept. of Meteorology.
B. Magnell.
Journal of Physical Oceanography, Vol. 6, No. 4, p 511-523, July 1976. 12 fig, 16 ref. NSF GA-30729X

Descriptors: *Atlantic Ocean, *On-site investigations, *Temperature, *Salinity, Instrumentation, Oceans, Conductivity, Data collections, Data transmission, Telemetry, Thermocline, Water temperature, Saline water, Oceanography.
Identifiers: *Salt finger convection, *Mediterranean Outflow region, *Salt fingers, Towed sensors.

A towed microstructure instrument has been used to measure small-scale conductivity fluctuations in a quasi-horizontal plane, as well as local vertical gradients of temperature and conductivity. This instrument was towed in the Mediterranean Outflow region (34 deg N, 11 deg W) in July 1973, in an area where 'step-like' vertical profiles of temperature and salinity had previously been observed. It was found that intense small-scale horizontal structure (1 cycle/cm) occurred in the thermocline on the thin high-gradient sheets which separated the mixed layers of the step-like structure. Good general agreement between the observed dominant wavelength and amplitude of this structure, and expected theoretical salt finger wavelength and amplitude, strongly suggested that this activity was salt finger convection. (sims-ISWS)
W77-00363

AN INVESTIGATION OF A COLD EDDY ON THE EASTERN SIDE OF THE GULF STREAM USING NOAA 2 AND NOAA 3 SATELLITE DATA AND SHIP DATA,
Research Triangle Inst., Research Triangle Park, N. C.
F. M. Vukovich.
Journal of Physical Oceanography, Vol. 6, No. 4, p 605-612, July 1976. 12 fig, 1 tab, 4 ref. NOAA/NESS 3-35402.

Descriptors: *Eddies, *Atlantic Ocean, *Remote sensing, *On-site investigations, Satellites(Artificial), Ships, Currents(Water), Ocean currents, Circulation, Ocean circulation, Water circulation, Data processing, Temperature, Water temperature, Entrainment, Salinity, Oceanography.
Identifiers: *Gulf Stream.

A study of a cold eddy on the eastern side of the Gulf Stream was performed combining data from the NOAA 2 and NOAA 3 satellites and from the Cape Fear Technical Institute's R/V Advance II. The satellite data were used initially to identify and locate the eddy in real-time. The location data obtained from the satellite imagery were used to plan an oceanic field program using the Advance II to collect temperature and salinity data in the perturbation. The analysis of satellite data indicated that the cold eddy was elliptic in shape with the major axis varying from 180 to 120 km and a minor axis varying from 120 to 100 km. The analysis also suggested that the circulation of the eddy was entraining warm Gulf Stream water, strengthening the warm ring around the eddy. The subsurface analysis indicated that the cold eddy was characterized by a very pronounced dome of relatively cold, less saline water below 200 m. Above 200 m, the temperature and salinity were uniform, both vertically and horizontally. (Sims-ISWS)
W77-00364

SIMILITUDE IN COASTAL ENGINEERING,
Tetra Tech. Inc., Pasadena, Calif.
For primary bibliographic entry see Field 8B.
W77-00380

MEASUREMENTS OF ESTUARY DISPERSION COEFFICIENTS,
Rhodesia Univ., Salisbury. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-00381

GEOGRAPHICAL AND SEASONAL VARIABILITY OF MARINE PLANKTON.
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W77-00393

ZOOPLANKTON OF DIKSON BAY (KARA SEA),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W77-00395

SPECIES COMPOSITION AND DISTRIBUTION OF ECOLOGICAL COMPLEXES OF ZOOPLANKTON IN THE ENISEI GULF,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W77-00399

GEOGRAPHICAL VARIABILITY OF SOME SPECIES OF THE FAMILY OITHONIDAE (COPEPODA, CYCLOPOIDA),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W77-00400

PROXIMATE NUTRITIVE VALUE CHANGES DURING DECOMPOSITION OF SALT MARSH PLANTS,
Mississippi State Univ., Mississippi State.
For primary bibliographic entry see Field 5C.
W77-00402

FISHERY AND BIOLOGY OF METAPENAEUS MONOCEROS (FABRICIUS) FROM THE GODAVARI ESTUARINE SYSTEM,
Central Inland Fisheries Research Inst., Barrackpore (India).
M. Subrahmanyam.
Indian J Fish. 20(1), p 95-107, 1973.

Descriptors: *Crustaceans, *Estuaries, *Asia, Mangrove swamps, Swamps, Fish diets, *Fish genetics, *Shrimp, Shellfish, *Commercial shellfish, Fish reproduction, Asia.
Identifiers: Foraminifera, *India, *Metapenaeus-Monoceros, *Prawns, Guatami estuary.

M. monoceros (Fabricius) is one of the important commercial prawns and comprises about 42% in the total prawn landing in the Gautami estuary (India). It is abundant in the lower reaches of the estuaries, particularly in the mangrove swamps and backwaters. The main fishing season extends from Oct.-Jan./Feb. and the dominant sizes in the commercial catches range between 26 mm-65 mm. Drag nets and stake nets are the main gear employed in the fishery. Under laboratory conditions the average growth rate was about 13 mm/mo., while the estimated growth from size frequency distributions ranged between 5 mm and 15 mm/mo. The size of the prawns leaving the estuary was 45-50 mm. Laboratory experiments showed that the prawns were active at night and burrowed into the substratum during the day. The post-larvae entered the estuary in large numbers at night almo throughout the year. The overall sex ratio of t prawns was more or less unity. Plant matter, ganic detritus, small crustaceans and foramifer shells formed the main diet of the prawn.—Co right 1975, Biological Abstracts, Inc.
W77-00424

TRACE-METAL LEVELS IN THE WATE AND SEDIMENTS OF CORIO B (AUSTRALIA),
Melbourne Univ., Parkville (Australia). School Chemistry.
For primary bibliographic entry see Field 5A.
W77-00446

YELLOW SUBSTANCE (GELBSTOFF) AND I CONTRIBUTION TO THE ATTENUATION PHOTOSYNTHETICALLY ACTIVE RAD TION IN SOME INLAND AND COAST SOUTH-EASTERN AUSTRALIAN WATERS,
Commonwealth Scientific and Industrial Resea Organization, Canberra (Australia). Div. of F Industry.
For primary bibliographic entry see Field 5C.
W77-00448

STOICHIOMETRIC DISTANCE AND TOT CONCENTRATION: A BINARY NUMERIC DESCRIPTION OF INLAND WATER CEHM TRY,
Tasmania Univ., Hobart (Australia). Dept. Botany.
For primary bibliographic entry see Field 2K.
W77-00449

DISTRIBUTION OF BENTHO FORAMINIFERS OFF THE WESTERN CO OF SOUTH AMERICA, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut O anologii.
T. A. Khusid.
Okeanologiya. 14(6), p 1092-1097, 1974.

Descriptors: *South America, *Pacific Oc *Bottom sediments, Sediments, *Bent Biomass, Distribution patterns, Spatical distr tion.
Identifiers: Bolivina-subexcavata, Brizal costata, Epistominella-pacifica, *Foramini Reophax-dentaliniformis, Reophax-dentaliniformis, *Vertical distribution.

Studies were made of the vertical quantitative tribution of benthonic foraminiferans, and t biomass in the bottom sediments on the Pa continental slope of South America. The ar characterized by high numbers and biomas foraminiferans. In all the vertical zones, number of species is not high; the following cies are dominant by numbers. Brizalina cos Bolivina subexcavata, Epistominella paci Reophax subdentaliniformis and R. dentalin mis. The quantitative distribution foraminiferans and their biomass is similar to distribution of macrobenthos.—Copyright I Biological Abstracts, Inc.
W77-00496

ON THE OCEANOGRAPHIC CONDITIONS OYSTER FARMING AREA NEAR CHUNG (IN KOREAN),
Tong-yeong Fisheries Junior Technical (Republic of Korea).
D. B. Lim, C. Hwan Cho, and W. Sup Kwon.
Bull Korean Fish Soc. 8(2), p 61-67, 1975.

Descriptors: *Oysters, *Shellfish farm *Environmental effects, Bays, Oceans, Fish trol agents, Fish behavior, *Aquacul Oceanography, Chlorophyll, Mortality, Salini
Identifiers: Chungmu(Korea), *Korea.

Oceanographic conditions in the coastal water round Chungmu, one of the most important yster farming areas in Korea, were studied from lay-Nov. 1974 to determine the environmental in-uences on oyster farming. Six localities, Goseong ay, Jaran Bay, off Saryangdo, Hansilpo, Tong-eong Bay and Juklimpo were selected for onthly oceanographic observation and biological ampling. Flood current running westward brings a line water from the SE and ebb current brings e low salinity water of Jinju Bay into the area. he waters in Juklimpo, Hansilpo and Tong-yeong ay are slightly cooler and more saline than the aters in Goseong Bay, Jaran Bay and off aryangdo. The amount of dissolved O2 is lowest Sept. and Hansilpo has the least O2 during mmer. Silicate content is lower in waters of ong-yeong Bay, Juklimpo and off Saryangdo an those of Goseong Bay, Hansilpo and Jaran ay. Suspended matter in this area ranges from 2-16.6 mg/l; it is scarce in Jaran Bay, Juklimpo nd off Saryangdo. Chlorophyll a shows large easonal variation and local fluctuation. Composi-on of phytoplankton reveals the difference etween the waters of Goseong Bay, Jaran Bay nd off Saryangdo and the waters of Hansilpo, ong-yeong Bay and Juklimpo. The growth of ysters was good in Juklimpo, Tong-yeong Bay nd Goseong Bay and worst in Hansilpo. The ighest mortality (82%) was observed in the waters ff Saryangdo.--Copyright 1976, Biological Ab-racts, Inc.
W77-00498

IET OF HIPPOGLOSSINA MACROPS STEINDACHNER) IN MEJILLONES (PISCES, OTHIDAE), (IN SPANISH),
Universidad de Norte, Antofagasta (Chile).
Tomicic-K.
Mus Nac Hist Nat Not Mens (Santiago). 17(205), p 7, 1973.

Descriptors: *Fish diets, Fish, Fish food organ-ms, Bays, South American, Crustaceans.
Identifiers: Pisces, Bothidae, *Chile, Hippoglossina-Macrops, *Mejillones Bay(Chile), Deuroncodes-Monodon.

pecimens (287) of H. macrops, captured at Mejil-nes Bay (Chile) from Aug.-Nov. 1971, were mea-ured (total length) and the stomach contents were nalyzed. The preferred food is crustaceans. The ngth frequency distribution shows 3 clear modal roups. The feeding of the 3 groups was com-ared; groups I and III have almost completely dif-erent diets. Both groups probably occupy dif-erent ecological niches. Group II is the transition etween group I and group III. Only 1 animal, Deuronocodes monodon, was found in the diet of 1 3 modal groups.--Copyright 1975, Biological bstracts, Inc.
W77-00502

OTAMOGETON PERFOLIATUS IN A RACKISH-WATER ESTUARY AT ORA, REDRIKSTAD (S. NORWAY), (IN NORWEGI-N),
orsk Institutt for Vannforskning, Blindern.
or primary bibliographic entry see Field 5C.
W77-00508

ENTHIC BIONOMY OF THE CONTINENTAL HELF OF THE FRENCH CATALONIAN OAST: 8. MACROFAUNA AND MEIOFAUNA, UANTITATIVE AND BIOCENOTIC RELA-IONS, (IN FRENCH),
Museum National d'Histoire Naturelle, Paris France). Laboratoire de Biologie des Invertebres arins.
. Guille, and J. Soyer.
ie Milieu Ser B Oceanogr. 24(2), p 301-320, 1974.

Descriptors: Wildlife, *Copecods, Aquatic life, ankton, Seston, Zooplankton, Crustaceans, Europe, *Aquatic populations, Population, *Analysis, *Continental Shelf, *Benthic fauna, Ecology.
Identifiers: Bionomy, Catalonian coast, Fauna, Taxocenosis, *France.

In qualitative terms, the distribution of the populations of harpacticoid copepods on the continental shelf of the French catalonian coast corresponds largely to the distribution of the communities of the macrofauna. Complementary units or bionomical subdivisions may be distinguished according to the higher sensitibility of the meiofauna to the physicochemial conditions, mainly thermal and granulometric. The structure of the populations of the 2 stocks shows that the high specific diversity of the harpacticoids varies only to a certain extent with different populations; the different populations; the different groups forming the macrofauna generally show a preference for 1 type of biotope. These comparisons between taxocenoses, and between taxocenoses and biocenoses, seem to improve the bionomical definition of a region in spite of the different dimensional levels of the ecological niches of the taxa considered. The density of macrobenthos is feeble as compared to the densities in the boreal zone; the quantity of meiobenthic organisms is very similar. The latter category shows, a higher relative importance which is apparently related to its capacity to occupy small ecological niches and to proliferate in areas not favoring the development of macrofauna. The numerical quantitative evolution of the 2 stocks is parallel, being related to the bathymetry. The biomass of the macrobenthos may be relatively independent of the density because of the diversity in the size of its components, in contrast to the meiobenthos. The weight ratio shows that the meiobenthos comprises 4.75% of the biomass of the macrobenthos. On the continental shelf of the French catalonian coast, the importance of the meiobenthos in terms of ingested food and biomass entering the food chain is about 24%.--Copyright 1976, Biological Abstracts, Inc.
W77-00516

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WASTEWATER TREATMENT BY REVERSE OSMOSIS,
Hitachi Ltd., Tokyo (Japan). Environmental Protection Systems Div.
For primary bibliographic entry see Field 5D.
W77-00081

3B. Water Yield Improvement

FINAL REPORT ON AN INVESTIGATION OF PRECIPITATING ICE CRYSTALS FROM NATURAL AND SEEDED WINTER OROGRAPHIC CLOUDS,
Western Scientific Services, Inc., Fort Collins, Colo.
L. Vardiman, and C. L. Hartzell.
Report SR-359-4, June 1976. 129 p, 98 fig, 8 tab, 11 ref, 5 append. Bureau of Reclamation 14-06-D-6644.

Descriptors: *Weather modification, Cloud physics, *Ice crystals, *Colorado, Rocky mountain region, *Orographic clouds, *Cloud seeding, Silver iodide.
Identifiers: San Juan Mountains(Colo).

Findings are presented of an investigation into the changes expected in ice crystal characteristics caused by silver iodide seeding of winter, orographic clouds in the San Juan Mountains of Colorado. Ice crystal data were collected from 22 storms near Wolf Creek Pass for the period of February 1973 through March 1975. Additional data on ice nuclei and cloud-top temperatures were also obtained. Analyses were performed on the crystal type, size, concentration, and the amount of rime under seeded and natural conditions. The storms were subdivided into three-hour blocks based on sounding times. Each block was classified into a seed or nonseed category depending on generator operations and ice nucleus concentrations. A total of 66 three-hour blocks was studied. Changes in ice crystal characteristics were observed near Wolf Creek Pass when artificial nuclei were detected in and slightly upwind of the target area. Precipitation and ice crystal concentrations were increased and riming was decreased as expected. Relative concentrations of plates and columns were increased. Crystal diameter was increased against expectation. Ice crystal concentration measured at KP3 does not appear to be a function of cloud-top temperature for either seeded or nonseeded cases. However, seeding does increase the crystal concentration at all temperatures. (Bur Reclam)
W77-00096

MEASUREMENTS OF LIQUID WATER CONTENT IN WINTER CLOUD SYSTEMS OVER THE SIERRA NEVADA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2B.
W77-00164

EROSION AND RUNOFF ON FOREST AND RANGE LANDS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W77-00332

ESTIMATION AND SIMULATION OF SHEET RUNOFF,
Commonwealth Scientific and Industrial Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 4A.
W77-00439

WATER RELATIONS OF GLYCYRRHIZA GLABRA L. UNDER DESERT CONDITIONS,
Cairo Univ., Giza (Egypt). Dept. of Botany; and Cairo Univ., Giza (Egypt). Faculty of Science.
For primary bibliographic entry see Field 2I.
W77-00500

3C. Use Of Water Of Impaired Quality

BEFORE REMOVING NUTRIENTS...REANALYZE LAKE TAHOE,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5C.
W77-00045

WATER-REUSE SYSTEMS STAR AT CINCINNATI AICHE MEETING,
For primary bibliographic entry see Field 5D.
W77-00054

SODIUM CARBONATE IN GROUND WATERS OF THE TURKMEN SSR, (IN RUSSIAN),
I. N. Stepanov, V. S. Muratova, and Z. F. Povetukhina.
Probl Osvoeniya Pustyn' 2, p 79-81, 1975.

Descriptors: *Groundwater, *Carbonates, Irrigation, Water pollution.
Identifiers: **Turkmen-SSR, USSR, *Sodium carbonate.

Ground waters containing sodium carbonate are found throughout the whole territory of Turkmenistan (USSR). Sodium carbonate in the process of irrigation deteriorates the meliorative conditions of the territory.--Copyright 1976, Biological Abstracts, Inc.
W77-00384

EFFLUENT-FREE BLEACHED KRAFT PULP MILL. PART VII. SODIUM CHLORIDE IN ALKALINE PULPING AND CHEMICAL RECOVERY,
Erco Envirotech Ltd., Islington (Ontario).
For primary bibliographic entry see Field 3E.
W77-00466

3D. Conservation In Domestic and Municipal Use

APPLICATION OF A HYDROLOGIC MODEL TO THE PLANNING AND DESIGN OF STORM DRAINAGE SYSTEMS FOR URBAN AREAS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W77-00004

SLUDGE MANAGEMENT ALTERNATIVES FOR COASTAL CITIES,
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5E.
W77-00014

BY-PRODUCT SOLIDS MANAGEMENT ALTERNATIVES CONSIDERED FOR PHILADELPHIA,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5E.
W77-00015

SLUDGE DISPOSAL ALTERNATIVES FOR BOSTON,
Havens and Emerson Ltd., Cleveland, Ohio.
For primary bibliographic entry see Field 5E.
W77-00016

ALTERNATIVES FOR DISPOSAL FOR THE METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1,
Metropolitan Denver Sewage Disposal District Number 1, Commerce City, Colo.
For primary bibliographic entry see Field 5E.
W77-00017

ENERGY CONSERVATION PRACTICES IN MUNICIPAL SLUDGE MANAGEMENT,
Public Technology, Inc., Washington, D. C.
For primary bibliographic entry see Field 5D.
W77-00018

SAN DIEGO: CIVIL ENGINEERING INNOVATIONS ABOUND.
For primary bibliographic entry see Field 5D.
W77-00063

ECOLOGICALLY BALANCED COMMUNITY WASTEWATER DISPOSAL SYSTEMS MANAGEMENT FOR DEVELOPING COUNTRIES,
Jadavpur Univ., Calcutta (India).
For primary bibliographic entry see Field 5D.
W77-00066

URBAN STORMWATER DETENTION AND FLOW ATTENUATION,
For primary bibliographic entry see Field 5D.
W77-00078

URBAN WATERSHED MANAGEMENT USING ACTIVITY INDICATORS TO PREDICT WATER QUALITY,
Carnegie-Mellon Univ., Pittsburgh, Pa. Environmental Studies Inst.
For primary bibliographic entry see Field 5A.
W77-00106

COPING WITH INCREASING COSTS,
Black and Veatch, Kansas City, Mo.
R. F. Banker.
Journal American Water Works Association, Vol. 67, No. 11, p. 600-603, 1976.

Descriptors: *Water costs, *Inflation(Economic), *Water works, Peak loads, Financing, Water loss, Water rates, Economic efficiency, Capital costs, Operating costs, Maintenance costs.

The impact on water utilities of inflationary increases in unit costs of service and how to cope with them are discussed. Costs for electrical energy, supplies, and salaries plus fringe benefits usually cannot be controlled by the utility, but the utility can practice sound management, control purchase amounts, and use supplies efficiently. An objective study of utility operations might indicate areas for increased efficiency. Sometimes capital expenditures to improve service and system reliability can reduce operating expenses. Although operating expense increases affect the utility immediately, ultimately costs related to new capital investment affect the total budget. Sound facility design is essential. Alternatives for financing construction might reduce costs. System losses should be determined and eliminated. Peak demands should be smoothed; by improving the system-load factor, excess capacity in existing systems might meet growth requirements without increasing investment. When rate increases are necessary, public offficials and citizens must be assured that the system is well-run and that each is paying only a fair share of costs. Costs should be proportionally distributed when multiple services are provided by the water utility. New customers should finance system growth to prevent increased rates for all customers. (Buchanan-Davidson-Wisconsin).
W77-00172

DIGITAL-MODEL ANALYSIS TO PREDICT WATER LEVELS IN A WELL FIELD NEAR COLUMBUS, INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 4B.
W77-00482

3E. Conservation In Industry

AN OVERVIEW: SO YOU WANT TO RECYCLE YOUR WASTEWATER. HOW SHOULD YOU BEGIN. IS IT FEASIBLE,
For primary bibliographic entry see Field 5D.
W77-00079

ENVIRONMENT, ENERGY, AND CAPITAL IN THE FOSSIL FUELED ELECTRIC POWER INDUSTRY,
Houston Univ., Tex.
R. G. Thompson, L. T. Moore, J. A. Calloway, H. P. Young, and R. J. Lievano.
Computers and Operations Research, Vol. 3, No. 2/3, p 241-257, August 1976. 9 fig, 12 tab, 14 ref.

Descriptors: *Environment, *Linear programming, *Economics, *Electric power industry, *Fossil fuels, *Energy, Evaluation, Management, Capital costs, Operating costs, Marginal costs, Optimization, Waste treatment, Water quality control, Effluents, Air quality, Water, Utilization, Wastes, Mathematical models, Systems analysis.
Identifiers: Cost minimization.

Shown is how cost-conscious managers in the fossil-fueled electric power industry would respond to legislated environmental policy, increasing electricity requirements, higher resource prices, and decreased capital availability. A linear programming economic model has been used to evaluate how managers would substitute production processes, factor inputs (fuel, water, capital), and waste discharges for each specification of environmental policy and availabilities of energy and capital. The model synthesizes the important technical information into a comprehensive economic basis for analysis. All prices and costs are in constant 1973 dollars. According to results, imposition of the most stringent environmental constraint increased production costs by 50%. Stringent air pollution criteria causes shifts both away from use of high-sulfur coal and toward generation by new technologies. As electricity requirements increased, effluent standards became more restrictive, clean fuel became scarcer, shifts toward generation by the new technologies again occurred and marginal and average costs of production increased. Demand by utilities for low-sulfur coal was especially sensitive to the price of coal. Capital requirements for utilities through 1985 generally fell within forecast limits of availability from the economy except for the lowest forecast of captial availability. (Bell-Cornell)
W77-00118

MARINE SAND AND GRAVEL MINING,
Geological Survey, Menlo Park, Calif. Conservation Div.
M. J. Cruckshank, and H. D. Hess.
Oceanus, Vol. 19, No. 1, p. 32-44, 1975. 11 fig., 2 tab., 14 ref.

Descriptors: *Continental margin, *Sands, *Gravels, *Mining, Environmental effects, Dredging, Costs, Monitoring.
Identifiers: *Marine mining.

Based on current projections the world's terrestrial supply of sand and gravel will be depleted by the year 2000. To meet anticipated needs, sand and gravel deposits on the coastal margins are being considered. Marine aggregates mining has been very limited in the United States since public protests have resulted in dredging moratoria in most coastal areas. Costs would be competitive with those on land. It has been estimated that about 1400 billion tons are present in all U.S. coastal regions in a ratio of about 15 to 1, sand to gravel. Underwater mining is usually by a dredge that digs a pit or one that skims off the top layer of material. Environmentally this may alter the sea floor shape, interfere with other uses, and disturb marine ecosystems. Both beneficial and adverse effects are possible. Resource conservation and environmental management research is needed. Continual monitoring will be required. Adverse environmental effects are probably more damaging to physical features of coastal areas and the resource base than the ecology. With adequate information on the deposits and environment, sound resource management practices could prevent or minimize damage of mining operations. (Buchanan-Davidson-Wisconsin).
W77-00195

STATUS REPORT ON ABATEMENT OF EF FLUENTS FROM THE CANADIAN PULP AND PAPER INDUSTRY -- 1974.
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W77-00331

COLOR REMOVAL FROM SOFTWOOD KRAFT CAUSTIC EXTRACT EFFLUENT BY POLYAMINES,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5D.
W77-00335

ORPTION ON ACTIVATED CARBON OF IM-RITIES OF TEXTILE INDUSTRY EF-UENTS (SORPCJA ZANIECZYSZCZEN ZE IEKOW PRZEMYSLU WLOKIENNICZEGO WEGLU AKTYWNYM),
ntralne Laboratorium Dziewiarstwa (Poland).
r primary bibliographic entry see Field 5D.
7-00339

PER CHEMICAL RECLAMATION AND USE VIA REVERSE OSMOSIS,
r primary bibliographic entry see Field 5D.
7-00340

FECTIVENESS OF WASTEWATER TREAT-ENT AT THE SHOSTKA 50TH ANNIVERSA-OF THE USSR CHEMICAL PLANT, (IN SSIAN),
r primary bibliographic entry see Field 5D.
7-00351

VIRONMENTAL FACTORS IN PRODUCING PPLEMENTAL FUELS,
r primary bibliographic entry see Field 6G.
7-00390

E VIEW OF THE PAPER INDUSTRY ON E OCCURRENCE OF PCB'S IN THE EN-RONMENT AND THE NEED FOR REGULA-ON,
ntainer Corp. of America, Carol Stream, Ill.
r primary bibliographic entry see Field 5B.
7-00461

ATEMENT RELATING TO PLYCHLORINATED BIPHENYLS ON BE-ALF OF THE WISCONSIN PAPER COUNCIL,
rgstrom Paper Co., Neenah, Wis.
r primary bibliographic entry see Field 5B.
7-00462

NTRIFUGE PLUS LIME LIMITS LIGNIN IN ASTE WATER,
r primary bibliographic entry see Field 5D.
7-00464

ENT SEMICHEMICAL PULPING LIQUORS. IMPROVEMENT OF COLOR-REMOVAL FICIENCY BY PHOTOCHEMICAL TREAT-ENT (IN JAPANESE),
ushu Univ., Fukuoka (Japan).
r primary bibliographic entry see Field 5D.
7-00465

FLUENT-FREE BLEACHED KRAFT PULP LL. PART VII. SODIUM CHLORIDE IN AL-LINE PULPING AND CHEMICAL COVERY,
co Envirotech Ltd., Islington (Ontario).
W. Reeve.
p and Paper Canada, Vol. 77, No. 8, p 35-37, 41-42, 44-45 (T136-142), August, 1976. 7 fig, 4 , 78 ref.

scriptors: *Pollution abatement, *Pulp wastes, odium chloride, *Bleaching wastes, *Water servation, Water pollution sources, Wastes, ustrial wastes, Water pollution control, aporation, Effluents, Publications, Reviews, ter reuse, Recirculated water.
ntifiers: *Chemical recovery, *Kraft mills, shing(Pulp), Black liquor, White liquor.

review of the literature on NaCl in alkaline ping and chemical recovery is presented. The ut of NaCl with wood, chemicals, and water ply, the history of NaCl accumulation in overy systems, and methods available for Cl control and removal are reviewed. In the ef-ent recovery program, all effluents from a D/CEDED bleach plant are used to wash the brown stock and to prepare fresh cooking liquor. Sodium chloride, as a spent bleaching chemical, thereby enters the pulping chemical recovery cycle. White liquor is evaporated to recover the NaCl in pure crystalline form and to control NaCl load in the recovery cycle by the salt recovery process (SRP). Alkaline pulping and chemical recovery operations are not significantly affected by the moderate NaCl concentrations and loads which result from the proposed system. There is no apparent effect of NaCl on cooking, brown stock washing, black liquor evaporation, or white liquor preparation. Some of the properties of black liquor, smelt, and furnace dust are changed, but no significant effect results. (See also W74-07379 and W74-05275) (Sykes-IPC)
W77-00466

3F. Conservation In Agriculture

CHARACTERISTICS OF RURAL HOUSEHOLD WASTEWATER,
Wisconsin Univ., Madison. Small Scale Waste Management Project.
For primary bibliographic entry see Field 5A.
W76-00048

WEATHER-DEPENDENT PRICING FOR WATER RESOURCES IN THE TEXAS HIGH PLAINS,
International Bank for Reconstruction and Development, Washington, D. C.
M. N. Lane, and S. C. Littlechild.
Water Resources Research, Vol. 12, No. 4, p 599-605, August 1976. 4 tab, 9 ref.

Descriptors: *Irrigation water, *Pricing, *Linear programming, Optimization, Weather, Reservoirs, Water supply, Farms, Profit, Crops, Constraints, Costs, Rainfall, Equations, Mathematical models, Systems analysis.
Identifiers: Uncertainty, High Plains of Texas.

Two alternative schemes for pricing irrigation water are examined. Under the first scheme, price is independent of weather; in the second scheme, price varies with weather so as to generate just enough demand to exhaust reservoir capacity. The second scheme provides savings through the more efficient utilization of available reservoir supplies and through the curtailing of demand so as to allow the construction of smaller reservoirs. The analysis proceeds by means of a linear programming under uncertainty model of a representative farm. The model is applied to the High Plains of Texas. Results suggest that the weather-dependent pricing scheme would increase farm profits by the order of 10%per annum.
W77-00122

SURFACE RUNOFF LOSSES OF FERTILIZER ELEMENTS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy; and Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5B.
W77-00165

NITROGEN IN SUBSURFACE DISCHARGE FROM AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 5B.
W77-00166

A REGIONAL MARKET FOR RIGHTS TO USER FERTILIZER AS A MEANS OF ACHIEVING WATER QUALITY STANDARDS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-00173

USING LINEAR PROGRAMMING TO EVALUATE AGRICULTURAL FLOOD CONTROL PROJECTS,
Economic Research Service, Berkeley, Calif. Natural Resource Economics Div.
D. G. Piper.
Journal of Soil and Water Conservation, Vol. 30, No. 5, p. 227-230, 1975. 1 fig., 3 tab., 8 ref.

Descriptors: *Cost-benefit analysis, *Agriculture, *Project benefits, *Flood control, *Evaluation, Linear programming, Model studies, River basin development, Water resources development, Crop production, Flood protection, *Indiana.
Identifiers: Wabash River Basin(Ind).

A regional least-cost linear programming model for river basin planning was developed to identify the economic potential for water resource development as related to agricultural production. It is based on the assumptions that the region is internally homogeneous in each soil management group; constant returns per acre are obtained for each soil management group; available cropland acreage limits production and all crops compete for it; farmers minimize crop production costs; demands for food and fiber are exogenously determined and known; and available resources, input-output coefficients, and prices are known. If appropriately modified, this model can be used as an analytical framework and data base to evaluate agricultural benefits of proposed flood-control projects. Such a project evaluation model can estimate the cost of producing specified outputs from an area under conditions of present flood hazards and with flood protection. Differences between these two estimates provide a single measure of benefits reflecting direct damage reduction and net regional enhancement effects. The model also can provide estimates of probable land use changes associated with a change in the level of flood protection. (Buchanan-Davidson--Wisconsin)
W77-00180

STATE OF SOUTH CAROLINA WEATHER AND CROP SUMMARIES,
South Carolina Water Resources Commission, Columbia.
G. E. Richardson, J. C. Purvis, and R. Foster.
June 1976, 66 p, 25 fig, 4 tab.

Descriptors: Crop production, Precipitation(Atmospheric), Climates, *Rainfall, *South Carolina, Water supply, Climatic data, Weather data, Flood data, *Data collections.

A compilation of weather and crop data summaries for each month of 1975 in South Carolina is given. This is the third of a series designed to consider the relationships of crop productivity and precipitation, and the possibility that productivity is a predictable function of climatic conditions, particularly rainfall.(NOAA)
W77-00282

SPATIAL VARIABILITY IN SOILS BELOW DEPTH OF TILLAGE: BULK DENSITY AND FIFTEEN ATMOSPHERE PERCENTAGE,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-00284

TWO-DIMENSIONAL SOLUTES TRANSFER DURING NONSTEADY INFILTRATION: LABORATORY TEST OF MATHEMATICAL MODEL,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept of Agronomy.
For primary bibliographic entry see Field 2G.
W77-00288

VARIATIONS IN THE NATURAL ABUNDANCE OF N OF WHEAT PLANTS IN RELATION TO FERTILIZER NITROGEN APPLICATIONS,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
G. Shearer, and J. O. Legg.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 896-901, September-October 1975. 4 fig, 3 tab, 11 ref.

Descriptors: *Nitrogen, *Fertilization, *Fertilizers, *Wheat, Crop response, *Pennsylvania, Measurement, Laboratory tests.
Identifiers: *Soil fertility.

Measurements were made by two laboratories of the per mill (15)N excess of winter wheat plants grown at five locations in Pennsylvania on experimental plots. The plots were fertilized with N at various rates. The results from both laboratories showed a consistent decline in per mill (15)N excess with increasing rates of N application. Such a decrease in per mill (15)N excess is consistent with increasing contributions of fertilizer N to the plants as the rate of application increased, given that fertilizer N has a lower 15N content than the soil N. The coefficients of regression of per mill (15)N excess of wheat on N application rate were always negative and usually significantly different from zero. The regression coefficients computed from the results of the two laboratories were not significantly different from each other in 12 of 16 experiments. There was, however, a systematic, unexplained difference in the results from the two laboratories. A regression of one set of data on the other resulted in a regression coefficient significantly different from one, the theoretically expected value. (Skogerboe-Colo St)
W77-00292

ECONOMICS OF INCREASED MOBILITY FROM TILE DRAINAGE,
Mosul Univ. (Iraq). Coll. of Engineering.
A. S. Y. Aldabagh, and C. E. Beer.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 1, p 116-121, January-February 1975. 4 fig, 3 tab, 16 ref.

Descriptors: *Drainage, *Drainage engineering, *Drains, *Drainage systems, Economics, Economic impact, *Tile drains, Cost estimates.

The purpose was to estimate the added economic benefit of tile drainage from increased mobility of agricultural machinery. This was achieved by first relating the performance of vehicles to soil strength in terms of rating cone index. The rating cone index was evaluated by the cone penetrometer and remolding equipment. Relations then were developed between soil strength, moisture content, and depth to water table for poorly drained soils. Existing data were used in predicting the behavior of water table for various drain spacings and soil conductivities. A tile depth of 4 ft, a tile diameter of 0.5 ft, and a depth to the impervious layer below the drain of 4 ft, were assumed. The results were applied to determine the increased number of days in which machine operations can be performed during the planting season when tile drains with various spacings are used. (Skogerboe-Colorado State)
W77-00313

A SYSTEMATIC PROCEDURE FOR TAXING AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-00314

ANNOTATED BIBLIOGRAPHY ON TRICKLE IRRIGATION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
S. W. Smith, and W. R. Walker.
Information Series No. 16, June 1975. 61 p.

Descriptors: *Irrigation, *Irrigation effects, *Irrigation practices, *Irrigation design, *Irrigation efficiency, *Irrigation engineering, *Irrigation systems, Evapotranspiration, Fertilization, Crop response, *Bibliographies.
Identifiers: *Trickle irrigation, *Drip irrigation.

Trickle irrigation (or drip irrigation) is a relatively new approach to supplying agricultural crops with moisture where natural precipitation is inadequate. Research relating to trickle irrigation is being conducted throughout the world, including a significant effort in the United States. To date the application of this irrigation method in Colorado has been considered feasible only in orchards or greenhouses. However, increased emphasis on improving irrigation water management capabilities for salinity control, revegetation of lands disturbed by mining activities, etc. necessitates further examination. This report presents a compilation of 182 annotated references from approximately 30 sources of technical literature. Its purpose is to allow the reader to assess the existing knowledge and evaluate information relevant to the problems being encountered as well as indicating where further study is necessary. A key word index is provided as an appendix. (Skogerboe-Colo St)
W77-00315

PERFORMANCE AND EVALUATION OF COMBINED MOLE-TILE DRAIN SYSTEM IN HEAVY SOILS,
Utah State Univ., Logar.
For primary bibliographic entry see Field 4A.
W77-00316

AN EXPERIMENTAL BURIED MULTISET IRRIGATION SYSTEM,
Agricultural Research Service, Kimberly Idaho. Snake River Conservation Research Center.
R. V. Worstell.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois, 15 p, 8 fig, 2 tab, 7 ref.

Descriptors: *Irrigation, *Irrigation systems, Irrigation design, Irrigation effects, Irrigation efficiency, Irrigation practices, Water conservation, Soil moisture, Soil moisture movement, Design criteria, Construction, Operations

Criteria for the design, construction, and operation of an experimental buried lateral, gravity multiset irrigation system are presented. The system has a potential water application efficiency of 80% with very little runoff or erosion without automatic controls. With automatic controls and with water available on demand, light, frequent irrigations can be applied with efficiencies of 90 to 95%. The energy required to operate the system is minimal and labor requirements involve only periodic inspection and maintenance services. Cost and benefit estimates indicate that this system may be economically feasible, practical, and attractive at a time of rising energy costs and labor shortages. (Skogerboe-Colo St)
W77-00317

ENERGY GRADIENT LINE FOR DRIP IRRIGATION LATERALS,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
I-p. Wu, and H. M. Gitlin.
Journal of the Irrigation and Drainage Division, Proceedings of ASCE, Vol. 101, No. IR4, p 323-326, December 1975. 1 fig, 2 ref, append.

Descriptors: *Irrigation, *Irrigation design, *Hydraulics, *Irrigation systems, Mathematical analysis, Simulation analysis.
Identifiers: *Drip irrigation, *Trickle irrigation.

Derived mathematical equations for energy gradient lines can be applied to hydraulic analysis of both drip and sprinkler irrigation systems. Also, the equations can be used to simplify computer simulations for irrigation system studies and design. (Skogerboe-Colo St)
W77-00318

TRANSPORT OF CARBON14-ASSIMILATES IN THE SUGAR BEET UNDER DIFFERENT CONDITIONS OF NUTRITION AND MOISTURE, (IN RUSSIAN),
Kirgiz State Univ., Frunze (USSR).
For primary bibliographic entry see Field 5B.
W77-00421

EFFECT OF IRRIGATION PUMPING ON DESERT PUPFISH HABITATS IN ASH MEADOWS, NYE COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 8I.
W77-00427

THE VARIABILITY OF MONTHLY RAINFALL IN SOUTH AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Mathematical Statistics.
For primary bibliographic entry see Field 2B.
W77-00443

A WATER BALANCE MODEL AND SUPPLY INDEX FOR WHEAT IN SOUTH AUSTRALIA,
Commonwealth Scientific and Industrial Research Ogrganization, Adelaide (Australia). Div. of Soils.
E. L. Greacen, and C. T. Hignett.
CSIRO Australia Division of Soils, Technic Paper No. 27, 1976. 33 p., 14 fig., 23 ref., append.

Descriptors: *Computer models, *Water balance, *Wheat, *Available moisture, *Crop production, Water storage, Soil moisture, Soil-water-plant relationships, Water requirements, Evapotranspiration, *Australia.

A water balance model has been developed to simulate the soil water regime under wheat in southern Australia. Two soil layers are considered, broadly corresponding to the surface and subsoil horizons, on which the growing root zone of the crop is imposed. Required inputs for weather are daily rainfall and potential evaporation, and for the soil, the upper and lower limits of available water, field capacity and wilting point, and an initial starting point value for stored water. The performance of the model in predicting available water was best when the rate of uptake of soil water was limited by the length of roots in the subsoil. For ten crops covering three years, the discrepancy between predicted and measured stored water in the soil rarely exceeded one cm. A useful index of the water supply factor related to crop yield is given. The total water evaporated by the crop from seeding to standard week number accounted for 86 per cent of the variability in yield on ten well-documented sites. Details of the FORTRAN IV computer programme are given in an apendix. (CSIRO)
W77-00444

ENVIRONMENTAL CONSIDERATIONS IN EXPANDING AGRICULTURAL PRODUCTION,
Latin American Program for Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-00470

EROSION IN 1973-74: THE RECORD AND THE CHALLENGE,
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 2J.
W77-00471

PA AND AGRICULTURE: ESTABLISHING A ARTNERSHIP,
nvironmental Protection Agency, Washington, . C.
or primary bibliographic entry see Field 5G.
/77-00472

UALITATIVE COMPOSITION OF THE USPENDED SEDIMENTS OF THE ORDZ-ONIKIDZE IRRIGATION SYSTEM, (IN RUS-IAN),
or primary bibliographic entry see Field 2J.
/77-00497

IGHT-CHESTNUT LONG-IRRIGATED SOIL F THE SHARUR PLAIN, (IN RUSSIAN),
or primary bibliographic entry see Field 2G.
/77-00510

RIGIN AND USE OF RUDYAK SOILS, FER-UGINOUS SOLONCHAKS OF THE TAIGA ONE, (IN RUSSIAN),
loscow State Univ. (USSR). Dept. of Soil hysics and Reclamation.
or primary bibliographic entry see Field 2G.
/77-00511

NFLUENCE OF AN INSERTED ASPHALT AYER ON THE PLANT YIELD ON A LIGHT OIL, (IN POLISH),
nstytut Uprawny Nowozenia i Gleboznaqatwa, askowice Olawskie (Poland). Zaklad Uprawny oli.
Gonetowa, J. Sienkiewicz, and H. Zurawski.
amiet Pulawski. 60, p 7-18, 1974.

escriptors: *Plant growth, *Asphalt, Soil pres-ure, *Soil compaction, Water requirements, ats, Peas, Corn(Field).
dentifiers: Lupine, Mustard.

wo liquid asphalts of various viscosity and a solid sphalt were used in pot and microplot experi-ents. In pot experiments the direct influence of sphalt insertion on the yields of mustard, oats, aize and field pea were investigated. On icroplots maize, oats and lupine were grown in otation and the direct effect of inserted asphalt as ell as the after effect during 2 yr were in-estigated. The liquid asphalts had a toxic effect n all the plants, but the solid asphalt increased lant yield. The yield increases were higher in icroplot experiments where the inserted asphalt robably improved the water regime of plants dur-ng their vegetation.--Copyright 1975, Biological bstracts, Inc.
/77-00513

HE CHANGE OF CLAY MATERIAL IN CHER-OZEMS UNDER RICE CULTIVATION, (IN USSIAN),
loscow State Univ. (USSR). Dept. of Soil cience.
or primary bibliographic entry see Field 2G.
/77-00523

ECHANISM OF INTERACTION OF WEAKLY INERALIZED IRRIGATION WATER WITH OIL, (IN RUSSIAN),
loscow State Univ. (USSR). Dept. of Soil cience.
or primary bibliographic entry see Field 2G.
/77-00524

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

APPLICATION OF A HYDROLOGIC MODEL TO THE PLANNING AND DESIGN OF STORM DRAINAGE SYSTEMS FOR URBAN AREAS,
Utah Water Research Lab., Logan.
G. B. Shih, E. K. Israelsen, R. N. Parnell, Jr., and J. P. Riley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 639, Price codes: A05 in paper copy, A01 in microfiche. Publication PRWG86-1, May 1976. 79 p, 46 fig, 5 tab, 18 ref, 2 append. OWRT B-048-UTAH(1). 14-31-0001-3341.

Descriptors: Hydrographs, Economic prediction, Water resources development, Management, Computer programs, *Utah, *Model studies, *Planning, *Design criteria, Storm drains, *Storm runoff, *Urban drainage, Urban runoff, Simulation analysis, Watersheds(Basins).
Identifiers: Jordan River(Utah), Salt Lake County(Utah), *Urban watersheds.

A generally applicable hybrid computer program is developed to simulate runoff from urban watersheds, and is applied to represent the outflow hydrographs of three urban watersheds located within Salt Lake County, Utah. The gaged outflow of the watersheds provided a means for comparing the observed and the simulated final outflow hydrographs. Each of the three watersheds was subdivided into spatial units or subzones, and the outflow hydrographs for each subzone were obtained by abstracting interception, infiltration, and depression storage from the rainfall hyetograph of each subzone. The resulting hydrograph outflow of each subzone then was routed to the Jordan River, the final outflow point of the three watersheds. The final hydrographs of the three watersheds were combined and compared with the gaged flow. The unique features of this model are its ability to (1) accept a wide range of input hyetographs; (2) accommodate variable loss rates; (3) combine subzone hydrographs; and (4) combine watershed hydrographs into a single runoff function. In addition to numerical output, graphs can be plotted for visual inspection. This characteristic enables designers and planners to use the model to examine quickly both the physical and economic impacts of various possible input conditions and management alternatives.
W77-00004

DAMS AND PEOPLE: GEOGRAPHIC IMPACT AREA ANALYSIS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6B.
W77-00008

URBAN STORMWATER DETENTION AND FLOW ATTENUATION,
For primary bibliographic entry see Field 5D.
W77-00078

SOURCE AND TRIBUTARY-SOURCE LINK LENGTHS IN NATURAL CHANNEL NETWORKS,
New South Wales Univ., Kensington (Australia). School of Geography.
For primary bibliographic entry see Field 8B.
W77-00084

FLOAT CALIBRATION IN INTEGRATED-FLOAT TECHNIQUES,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
For primary bibliographic entry see Field 7B.
W77-00088

INTER-PLAN COMMUNICATION AND MOTIVATION STUDY, FINAL REPORT, FLORIDA BACKGROUND STUDY,
Sperry Urban Science Center, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-00098

FLOOD HAZARD ANALYSIS: CROOKED RIVER, TOWN OF CASCO, TOWN OF NAPLES, CUMBERLAND COUNTY, MAINE,
Soil Conservation Service, Orono, Maine.
Prepared for Casco and Naples, Maine, December 1974. 16 p, 4 fig, 21 plates, 3 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Maine, Streamflow forecasting, Peak discharge, Floodways, Flood protection, Non-structural alternatives, Control structures.
Identifiers: *Crooked River(ME), *Casco(ME), *Naples(ME), 100-year flood, Songo River(ME), 500-year flood.

Land use in the Crooked River Watershed is approximately 90% forest. Less than 1% of the land is urbanized or in recreational use, but this is expected to reach 2.8% by 1980. This watershed drains 152 square miles at its confluence with Songo River. Channel length in the study area is about 14 miles, from Tea Swamp to Sebago River. There is one dam in poor condition at Edes Falls. Fluctuation of the Sebago Lake level affects the stream bank erosion and flooding potential along lower reaches of the Songo and Crooked Rivers. There are no streamgages on Crooked River, but on the down-stream Sebago Lake, a high was recorded in 1936 which was considered a 50-year frequency event. Most floods occur in March through May and in November, the remainder being spread throughout the year. Projections on 10, 100 and 500 year frequency floods are presented in the form of flood profiles and flood plain maps. In a 100-year flood a peak discharge of 11,000 cubic feet per second is predicted for Crooked Creek at its confluence with Songo River. In a 500-year flood, a discharge of 14,800 cfs is anticipated. This report serves as a technical base upon which to formulate flood reduction measures, but does not detail such methods. A 1971 Maine law, 'Mandatory Zoning and Subdivision Control' requires municipal governments to adopt ordinances for shoreline areas. (Smith-North Carolina)
W77-00100

AN OVERVIEW OF THE IMPACT STUDY OF THE MCCLELLAN-KERR MULTIPLE PURPOSE ARKANSAS RIVER SYSTEM,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6G.
W77-00101

FLOOD PLAIN INFORMATION: REPORT ON RANCOCAS CREEK, BURLINGTON COUNTY, NJ (SUMMARY REPORT).
Army Engineer District, Philadelphia, Pa.
Prepared for Burlington County Planning Board, April 1967. 12 p, 8 fig, 10 plates.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Non-structural alternatives, *New Jersey, Floodwater, Streamflow forecasting, Maximum probable flood, Historic floods, Peak discharge, Flood plain zoning, Building codes, Reservoirs, Diversion structures, Channel improvement, Floodproofing.

Identifiers: *Rancocas Creek(NJ), Burlington County(NJ), Mount Holly(NJ), *Flood plain management, Standard Project Flood, Intermediate Regional Flood, Subdivision regulations.

Information is given on one mile of Rancocas Creek, 22 miles of the South Branch Rancocas Creek, and 12 miles of the North Branch Rancocas Creek. Floodplains along these streams are low flat marshlands in the tidal reaches in some sections and low, sometimes wooded, areas in other sections. The most extensively developed area is in Mount Holly, NJ along the North Branch of Rancocas Creek. Between 1960 - 1990, population in Burlington County is expected to double and, therefore, pressure to develop floodplains will be great. Development, with its concomitant increase in impervious surfaces, will increase flood hazards. A flood in 1940 is considered the greatest flood because it produced record high flows and flood stages. Ten inches of rain fell causing dams at Taunton and Medford Lakes to fail, resulting in flooding downstream. Property damage in Mount Holly alone was $129,000. Large floods generally occur in summer and early fall, however, lesser floods may occur at all times of the year. Maps and profiles give information on a 20-year flood, 100-year flood and Standard Project Flood. Flooding problems in this area can be compounded when high waters occur at times of high tide on the Delaware River. In 1944 the Corps of Engineers completed a $283,700 flood control project which included channel improvements, a diversion channel and a cut-off channel. This protects the business section of Mount Holly. Local dams and reservoirs also provide a small amount of protection. Guidelines for floodplain management are presented. (Smith-North Carolina).
W77-00102

SOCIAL IMPACT ASSESSMENT: AN OVERVIEW,
Colorado State Univ. Fort Collins.
For primary bibliographic entry see Field 6B.
W77-00103

FLOOD PLAIN INFORMATION: SOUTHAMPTON COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
Prepared for Southampton County, Virginia. June 1975. 24 p, 6 fig, 25 plates, 6 tab.

Descriptors: *Virginia, *River forecasting, *Flood profiles, *Flood stages, *Flood plains, Floods, Regional flood, Flood flow, Hurricanes, Historic floods, Flood data, Peak discharge.
Identifiers: *Standard Project Flood, *Intermediate Regional Flood, Courtland(VA), *Nottoway River(VA).

Except for the town of Courtland, properties along the Nottoway River are relatively undeveloped and consist of marsh, woodlands, farms and open space. These areas may come under pressure to develop, as the zone is very accessible by major highways. Southampton County is the leading hog producing county in Virginia and leads in peanut production in both the state and nation. The drainage area of the Nottoway River at its mouth is 1,695 sq mi. It joins the Blackwater River to form the Chowan River. The channel is generally well-defined and overbank areas are generally covered with vegetation. Floods occur in all seasons and result from intense rain or tropical hurricanes. Six large floods have occurred since 1940; the largest, in 1940, had a peak discharge or 48,000 cubic feet per second. Damaged were houses, roads, bridges and some deaths occurred. In an Intermediate Regional Flood (IRF) a peak discharge of 34,500 cfs and water velocities of 3.7 feet per second in the main channel and 1.6 ft/sec in the overbank area are expected. It is anticipated that it would take 68 hours to reach flood peak after flood stage is reached, with flood stage lasting 185 hours. A Standard Project Flood (SPF) would have a peak discharge of 54,000 cfs, slightly higher than the 1940 flood. Water velocities would be 3.8 and 1.7 ft/sec in the main channel and overbank, respectively. Time of rise would be about 116 hours and flood stage would last 252 hours. During an ERF, 5 of 8 bridges would be obstructive to flow and 7 would be obstructive during the SPF. In either flood, approach roadways on 3 highways will be submerged before water reaches low steel elevations on bridges. There are no existing flood control structures. The 100-year flood plain is governed by the State Building Code. (Smith-North Carolina)
W77-00104

FLOOD PLAIN INFORMATION: RESURRECTION RIVER AND SALMON CREEK, ALASKA.
Army Engineer District, Anchorage, Alaska.
Prepared for Kenai Peninsula Borough, Alaska. June 1975. 24 p, 12 fig, 18 plates, 3 tab.

Descriptors: *Alaska, *Floods, *Flood profiles, *Bank erosion, *Flood plains, *Tsunamis, Streamflow forecasting, Maximum probable flood, River forecasting, Historic floods, Flood data, Peak discharge, Flood damage, Erosion, Snowmelt.
Identifiers: *Resurrection River(AK), *Salmon Creek(Ak), Seward(AK), 100-year flood, 500-year flood, Channel changes.

Properties along the streams are mostly residential, and open spaces in the flood plain are now under pressure to develop. Though population of Seward has declined in recent years to 1,891 in 1974, future growth is expected. Resurrection River is glacial fed with a steep gradient through its drainage area of about 170 sq mi. Salmon Creek, a tributary of Resurrection River, has a drainage area of 36 sq mi. It has a steep braided channel and has overflowed its banks several times in recent years. Floods usually occur from August through November or in Spring; primary cause of flooding is rapid runoff during heavy rains. Little historic flood data exist, though floods have been recorded on one or both rivers since 1946. In a 100-year flood, it is anticipated that peak flows on Resurrection River and Salmon Creek will be 55,000 and 16,000 cubic feet per second, respectively. Velocities of up to 10 feet per second in the main channel and 3 ft/sec in the overland area are expected. A 500-year flood would have a peak discharge of 82,000 cfs and 24,000 cfs on Resurrection River and Salmon Creek, respectively Water velocities would be slightly higher than during the 100-year flood. Seward, located at the mouth of Resurrection River and at head of Resurrection Bay, is subject to riverine and coastal flooding. A tsunami like the one which occurred following the 1964 Alaska earthquake is rarer than the 500-year flood. The wave in 1964 caused extensive damage. Erosion of the alluvial material on the flood plain has been a problem in the past and is expected to be a problem in future floods. There are no existing flood control structures or flood plain management regulations in force. (Smith-North Carolina)
W77-00105

OPTIMAL DESIGN OF SINGLE RESERVOIR SYSTEM USING (DELTA) RELASE POLICY,
California Polytechnic State Univ., San Luis Obispo. Dept. of Computer Science and Statistics.
S. S. Luthra, and S. R. Arora.
Water Resources Research, Vol. 12, No. 4, p 606-612, August 1976. 3 fig 5 tab, 4 ref.

Descriptors: *Multiple-purpose reservoirs, *Design, *Reservoir releases, Water policy, Optimization, Inflow, Economics, Costs, Equations, Mathematical models, Systems analysis.
Identifiers: *Chance-constrained programming, Cost minimization, Linear decision rule, *Reservoir capacity.

Reservoirs provide storage capacity which serves to match more ideally the demands and supplies of water. The amount of storage required very criti cally depends upon the constraints on freeboard minimum pool level, and upon the permissibl limits on releases. Release policy also plays a ver critical role. During recent years, one of the poli cies which has attracted much attention is th linear decision rule policy. This policy passes o the variability of a particular period's inflow to th next period's release. Another release policy i presented, the delta release policy, where delta is parameter whose value distributes the effects o inflow variability between the releases and th pool level. It is shown that delta release polic requires smaller reservoir capacity than that ob tained by the linear decision rule policy. The op timization problem is formulated as a chance-con strained programming problem for minimizing th cost of the reservoir. (Bell-Cornell)
W77-00109

THE RELEVANCE OF TECHNOLOGICA CHANGE IN LONG TERM WATER RESOURC PLANNING,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W77-00113

ECONOMIC OPTIMUM RECORD LENGTH,
Nielsen and Rauschenberger A/S. Lyngb (Denmark).
S. Jacobi.
Nordic Hydrology, Vol. 6, No. 1,p 28-42, 1975. fig, 9 ref.

Descriptors: *Stochastic processe *Optimization, *Hydrology, *Design, *Decisio making, *Reservoirs, Monte Carlo method Simulation analysis, Storage, Projects, Sedimen load, Marginal costs, Marginal benefits, Data co lections, Mathematical models, Equation Systems analysis.
Identifiers: *Cost minimization, *Record lengt *Expected opportunity loss, *Uncertainty *Bayesian design approach.

Uncertainty in hydrologic design parameters reflected as an increase in expected project cost The Bayesian or statistical decision approac produces a minimum-cost decision for a specif design, yielding the expected opportunity los EOL, a measure of the uncertainty inherent in th decision process. The uncertainty stems from th fact that the population value of the desig parameters is unknown. Additional informatio can be obtained by collecting more data, and th value of these data is measured by the decrease EOL. But there are costs involved in getting add tional data: the cost of continued data collectio and the costs of delaying the construction of th project (benefits foregone). The expecte economic optimum record length is defined at th point where the marginal benefits of addition data are equal to the marginal costs of obtainin those data. The theory is applied to sediment los data used to design the sediment storage portion a reservoir. Based on an economic efficienc criterion, the expected optimum record length found to be 12 years, given that 5 years of data a available at the time of the analysis. Objective like environmental quality and social benefits a disregarded in this analysis. (Bell-Cornell)
W77-00117

A COMPUTERIZED SYSTEM FOR WILD LAN USE PLANNING AND ENVIRONMENTAL IM PACT ASSESSMENT,
Washington Univ., Seattle. Coll. of Fore Resources.
For primary bibliographic entry see Field 6G.
W77-00119

A STABLE ESTIMATOR FOR LINEA MODELS 1. THEORETICAL DEVELOPMEN AND MONTE CARLO EXPERIMENTS.
Pavia Univ. (Italy).

L. Natale, and E. Todini.
Water Resources Research, Vol. 12, No. 4, p 667-671, August 1976. 5 fig, 8 ref.

Descriptors: *Hydrologic systems, *Linear programming, *Estimating, Optimization, Simulation analysis, Monte Carlo method, Constraints, Hydrologic data, River basins, Networks, Drainage, Input-output analysis, Mathematical models, Systems analysis.
Identifiers: *Black box parameter estimation, Quadratic programming, Error minimization, Sensitivity.

Instant unit hydrograph (IUH) type linear models have been widely used to simulate many hydrologic systems. Unfortunately, the classical parameter estimators used to calibrate this type of model often fail to give a reliable and meaningful solution. It has been suggested that a set of constraints that can be deduced from the physics of the hydrologic system be imposed on the IUH in order to reduce the high sensitivity of the classical estimators to errors in the available data. Therefore, a mathematically correct constrained estimator has been devised, and its solution is obtained by using quadratic programming. The higher degree of efficiency of this estimator (smaller dispersion of the estimates about the true value) is shown numerically through Monte Carlo experiments. (Bell-Cornell)
W77-00123

MATHEMATICAL MODEL FOR PREDICTING THE CONSOLIDATION OF DREDGED MATERIAL IN CONFINED DISPOSAL AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 5B.
W77-00167

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 3, HYDROLOGIC FREQUENCY ANALYSIS,
Hydrologic Engineering Center, Davis, Calif.
L. R. Beard, and A. J. Fredrich.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A017 433, Price codes: A08 in paper copy, A01 in microfiche. Report HEC-IHD-300, April 1975. 143 p, 38 fig, 6 tab, 33 ref.

Descriptors: *Hydrology, *Analytical techniques, *Statistical methods, Data processing, Statistics, Frequency analysis, Frequency curves, Flood frequency, Runoff, Surface runoff, Forecasting, Correlation analysis, Probability, Hydrologic data, Climatology.
Identifiers: *Hydrologic engineering.

Statistical analysis as applied in hydrologic engineering consists of (1) estimating the future frequency or probability of hydrologic events based on information contained in hydrologic records, and (2) correlating interrelated hydrologic variables. In probability analyses, statistical methods permit coordination of observed data to yield a more accurate estimate of future frequencies than is indicated by the observed data. In correlation analyses, statistical methods provide means for deriving the best relationship for predicting the value of one variable from known value of other variables. The volume described and illustrates applications of statistical analysis in hydrologic engineering. The volume included the following items: (1)A review of the basic concepts of probability that are applicable in hydrologic engineering, with a guide to supplemental reading for further study, (2)Presentation of detailed computation procedures and supporting justification and computation aids for derivation of probability or frequency estimates based on analysis of hydrologic records that have been adjusted to be consistent with selected reference base conditions, and (3)A summary of procedures for developing 'regionalized' hydrologic frequency estimates, based on analyses of hydrologic records available at stream gaging stations, adjusted to provide generalized flood-frequency relations that are considered most representative of long-period hydrologic characteristics in various drainage areas in the region. (See also W74-11231, W74-11232, and W75-02283.) (Sims-ISWS)
W77-00169

OFFSHORE INDUSTRIAL-PORT ISLANDS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5G.
W77-00176

BEWARE THE WRATH OF OSIRIS,
J. Elkington.
New Scientist, Vol. 68, No. 979, p. 626-628, 1975.

Descriptors: *Africa, *Deltas, *Land reclamation, *Wetlands, Arid lands, Environmental effects, Planning, Fisheries, Irrigation, Aquaculture, Water pollution, Monitoring.
Identifiers: *Egypt, Nile River(Egypt), Lake Manzala(Egypt).

Agriculturally productive land is probably the most important physical constraint determining Egypt's potential growth. Previous reclamation efforts have involved the desert; now the northern wetlands are being considered. Construction of the Aswan High Dam caused the water table of the Nile Delta to rise and nutrient content of the water and sardine catches to decrease. Planning responsibilities for the wetland area are fragmented, especially for the Lake Manzala area. Land reclamation might require twenty years before cultivation due to high salinity, it would destroy a major fishing ground, reduce fish spawning grounds, destroy wetland flora and fauna, affect bird migration routes, and remove avian insectivorous species. Use of the lake's water for irrigation, if salinity were reduced, would also have ecological effects. Lake Manzala now supplies 25% of Egypt's annual fish consumption. Aquaculture experiments are being conducted. Pollution is a significant factor in determining the feasibility of either fish farming or irrigation. Environmental management with an effective monitoring system is an urgent priority as large scale land reclamation is ecologically irreversible. (Buchanan-Davidson--Wisconsin)
W77-00177

USING LINEAR PROGRAMMING TO EVALUATE AGRICULTURAL FLOOD CONTROL PROJECTS,
Economic Research Service, Berkeley, Calif. Natural Resource Economics Div.
For primary bibliographic entry see Field 3F.
W77-00180

UNITED STATES COAST PILOT 4 - ATLANTIC COAST FROM CAPE HENRY TO KEY WEST.
National Ocean Survey, Rockville, Md.
Fourteenth Edition, July 1976, 234 p, 2 fig, 21 tab, append.

Descriptors: *Navigation, *Navigable waters, *Coasts, Charts, Rivers and Harbors Act, Transportation, North Carolina, South Carolina, Georgia, Florida, Virginia, *Southeast US.
Identifiers: Intracoastal waterways, Waterways(Transportation), Navigable canals, Navigational charts, *Southeast US Coast.

The National Ocean Survey Coast Pilots are a series of eight nautical books that cover a wide variety of information important to navigators of the United States coastal and intracoastal waters. Most of this information cannot be shown graphically on the standard nautical charts and is not readily available elsewhere. Coast Pilot subjects include navigation regulations, outstanding landmarks, channel and anchorage peculiarities, dangers, weather, ice, freshets, routes, pilotage, and port facilities. The Coast Pilot is corrected through the dates of Notices to Mariners shown on the title page and should not be used without references to the Notices to Mariners issued subsequent to those dates. This volume of Coast Pilot 4, cancels the 13th (July 1975) Edition. Details are given for the following localities: Cape Henry to Key West, Cape Henry to Cape Lookout, Cape Lookout to Cape Fear, Cape Fear to Charleston Harbor, Charlston Harbor to Savannah River, Savannah River to St. Johns River, St. Johns River, St. Johns River to Miami, Miami to Key West and Intracoastal Water-way, Atlantic Section. (NOAA)
W77-00278

UNITED STATES COAST PILOT 5 - ATLANTIC COAST FROM GULF OF MEXICO, PUERTO RICO, AND VIRGIN ISLANDS,
National Ocean Survey, Washington, D.C.
Ninth Edition, July 1976. 348 p, 2 fig, 21 tab, append.

Descriptors: *Navigation, *Navigable waters, *Coasts, Charts, Rivers and Harbors Act, Transportation, *Gulf of Mexico, *Puerto Rico, *Virgin Islands, Mississippi River, Inland waterways, Southeast US.
Identifiers: *Intracoastal waterways, Waterways(Transportation), Navigable canals, Navigational charts, *Gulf coast.

The National Ocean Survey Coast Pilots are a series of eight nautical books that cover a wide variety of information important to navigators of the United States coastal and intracoastal waters. Most of this information cannot be shown graphically on the standard nautical charts and is not readily available elsewhere. Coast Pilot subjects include navigation regulations, outstanding landmarks, channel and anchorage peculiarities, dangers, weather, ice, freshets, routes, pilotage, and port facilities. The Coast Pilot is corrected through the dates of Notices to Mariners whown on the title page, and should not be used without reference to the Notices to Mariners issued subsequent to those dates. This volume of Coast Pilot 5, cancels the 8th (July 1975) Edition. Details are given for the following localities: Gulf of Mexico, Key West to Tampa Bay, Tampa Bay to Apalachee Bay, Apalachee Bay to Mobile bay, Mobile Bay to Mississippi River, Mississippi River to Sabine Pass, Sabine Pass to San Luis Pass, San Luis Pass to the Rio Grande, Intracoastal Waterway, Gulf Section, Puerto Rico, and the Virgin Islands. (NOAA)
W77-00279

ECONOMICS OF INCREASED MOBILITY FROM TILE DRAINAGE,
Mosul Univ. (Iraq). Coll. of Engineering.
For primary bibliographic entry see Field 3F.
W77-00313

ANNOTATED BIBLIOGRAPHY ON TRICKLE IRRIGATION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-00315

PERFORMANCE AND EVALUATION OF COMBINED MOLE-TILE DRAIN SYSTEM IN HEAVY SOILS,
Utah State Univ., Logan.
K. Unhanand, and K. Tuamsangiem.
International Commission On Irrigation and Drainage Bulletin, p 36-52, January 1975. 24 fig, 15 ref.

Descriptors: *Drainage, *Drainage effects, *Drainage practices, *Drainage system, *Drains, Soils, Soil water, *Tide drains.

A field experiment investigated the performance and cost of the combined mole-drain systems in heavy soils in comparison with a similar tile drain system. Three experimental plots consisted of a tile-drained plot, a combined (single mole) drained plot and a combined (double mole) drained plot. They were constructed with a tile drain spacing of 37 metres (120 feet) and a mole drain spacing of 1.83 metres (6 feet). The experimental results show that the combined systems were more effective than the drain system in lowering the water table. The difference in the effectiveness of the single mole drains and double mole drains was not distinctly apparent. No deterioration of the mole drains was detected during the two year test period. The cost analysis indicated that the annual cost of the combined systems is always less than that of an equivalent tile drain system even if the mole drains in the combined system have to be redrawn every year. (Skogerboe-Colo St).
W77-00316

MAPPING RUNOFF-PRODUCING ZONES IN HUMID REGIONS,
McGill Univ., Montreal (Quebec). Dept. of Geography.
T. R. Moore, and C. H. Taylor.
Journal of Soil and Water Conservation, Vol. 31, No. 4, p 160-164, July-August 1976. 5 fig, 27 ref.

Descriptors: *Mapping, *Runoff, Zoning, Humid areas, Hortons law, Hydrology, Overland flow, River flow, Land management, Rainfall intensity.
Identifiers: *Runoff-producing zones, Horton infiltration approach, River discharge, Infiltration capacity, Prediction technique, Saturated areas, Soil morphology.

In undisturbed humid regions, the saturated areas of a catchment play an important role in determining storm runoff through subsurface storm flow, return flow, and direct precipitation onto saturated areas. Field mapping showed that the extent of the saturated area varies seasonally from 15 to 51%. The saturated areas also served an important function in determining stream water quality and land capability. The best method of evaluating the size, location, and variation of saturated areas was by repeated field mapping. Topography had a major influence on the distribution of the saturated area. Soil morphology was a more useful criterion. From the distribution and type of gley morphology within a soil profile, the soil water regime and water table depth could be estimated. A number of relatively simple observations indicated fairly well the distribution of saturated areas in catchments. Estimates could also be derived from soil moisture budgets of typical types and hydrograph analysis. Each method had different applicability in different types of catchments. (Roberts-ISWS)
W77-00368

LINK SLOPE DISTRIBUTION IN CHANNEL NETWORKS,
Brock Univ., St. Catherines (Ontario). Dept. of Geological Sciences.
For primary bibliographic entry see Field 2A.
W77-00370

SIMILARITY OF THE MEAN MOTION OF FLUID PARTICLES DISPERSING IN A NATURAL CHANNEL,
Geological Survey of Canada, Ottawa(Ontario).
For primary bibliographic entry see Field 5B.
W77-00371

THE GENERATION OF RUNOFF FROM SUBARCTIC SNOWPACKS,
Washington Univ., Seattle. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2C.
W77-00372

ENERGY BALANCE COMPUTATIONS OF SNOWMELT IN A SUBARCTIC AREA,
Scarborough Coll., Toronto (Ontario) Div. of Social Sciences-Geography.
For primary bibliographic entry see Field 2C.
W77-00373

SOME DIFFERENCES BETWEEN DISTRIBUTING AND BRAIDING CHANNELS,
Macquarie Univ., North Ryde (Australia). School of Earth Sciences.
For primary bibliographic entry see Field 2E.
W77-00376

DATA PROCESSING: A REVIEW OF THE ROLE OF THE MINISTRY OF WORKS AND DEVELOPMENT,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 7C.
W77-00378

EFFECT OF OSMOTIC SUCTION ON THE GERMINATION OF WARM SEASON GRASSES, (IN JAPANESE),
Kyushu Agricultural Experiment Station, Kumamoto (Japan).
For primary bibliographic entry see Field 2I.
W77-00422

EFFECT OF SOIL WATER SUCTION ON THE GERMINATION AND EMERGENCE OF WARM SEASON GRASSES, (IN JAPANESE),
Kyushu Agricultural Experiment Station, Kumamoto (Japan).
For primary bibliographic entry see Field 2I.
W77-00423

HYDROLOGIC UNIT MAP--1974, STATE OF IOWA
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-00425

MEAN ANNUAL RUNOFF IN THE UPPER OHIO RIVER BASIN, 1941-70, AND ITS HISTORIC VARIATION,
Geological Survey, Harrisburg, Pa
For primary bibliographic entry see Field 2E.
W77-00428

HYDROLOGIC UNIT MAP--1974, STATE OF WYOMING.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-00429

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 4. ST. LAWRENCE RIVER BASIN--VOLUME 2. ST. LAWRENCE RIVER BASIN BELOW LAKE HURON.
Geological Survey, Reston, Va.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, $5.50. Water-Supply Paper 2112, 1976. 738 p, 1 fig.

Descriptors: *Hydrologic data, *Surface waters, *Streamflow, *Lakes, *St. Lawrence River, River basins, Indiana, Michigan, New York, Ohio, Pennsylvania, Vermont, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow, Reservoir stages.
Identifiers: *St. Lawrence River basin, Maximum discharges, Minimum discharges.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the St. Lawrence River basin below Lake Huron. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W77-00431

DEVELOPMENT OF A STANDARD RATING FOR THE PRICE PYGMY CURRENT METER,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7B.
W77-00432

FLOODS OF MARCH-APRIL 1973 IN SOUTHEASTERN UNITED STATES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W77-00434

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1975.
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 7C.
W77-00435

ESTIMATION AND SIMULATION OF SHEET RUNOFF,
Commonwealth Scientific and Industrial Organization, Canberra (Australia). Div. of Land Use Research.
J. R. Ive, C. W. Rose, B. H. Wall, and B. W. R. Torssell.
Australian Journal of Soil Research, Vol 14, No 2, p 129-138, June 1976. 3 fig, 2 tab, 23 ref, append.

Descriptors: *Model studies, *Surface runoff, *Water balance, *Soil moisture, Water storage, Water loss, Antecedent moisture content, Storm runoff, Pastures, Rainfall-runoff relationships, Plant growth, Australia, Estimating.

Many water use models assume that surface runoff is negligible or that it occurs only after a defined soil water storage has been filled. In areas where rainfall is characterized by high intensity storms of short duration, such as the dry monsoonal area of northern Australia, such models overestimate soil water storage. A study is reported which aimed to estimate sheet runoff in such a situation and to demonstrate its importance by evaluating the improvement achieved when a runoff function is included in a water balance routine of a simulation model. Runoff was estimated for a Townsville stylo - annual grass pasture with a 1% slope using neutron hydrometry supplemented by gravimetric soil sampling, both carefully timed with respect to the rainfall event. An empirical model relating sheet runoff to antecedent soil moisture content and the standard daily rainfall total was developed and incorporated into an existing growth model which included a water balance routine. The soil water values simulated with the runoff model included were significantly closer to experimental values than when runoff was assumed to be zero; this improvement was consistent with an improvement in subsequent dry matter simulation. (CSIRO)
W77-00439

MAGNITUDE AND FREQUENCY OF FLOODS IN NORTH CAROLINA: TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS ON NATURAL STREAMS IN NORTH CAROLINA,
Geological Survey, Raleigh, N. C.
For primary bibliographic entry see Field 2E.
W77-00480

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON FISHKILL CREEK, FISHKILL, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4C.
W77-00483

LAKES MARION-MOULTRIE STREAM SYSTEM INVESTIGATION: PART II-SIMULATION STUDIES,
Geological Survey, Columbia, S.C.
H. H. Jeffcoat, M. E. Jennings, D. L. Collins, and J. O. Shearman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 713, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-11, March 1976. 26 p, 7 fig, 5 tab, 2 ref.

Descriptors: *Streamflow forecasting, *Reservoirs, Hydrology, *Simulation analysis, *Water balance, Methodology, Model studies, Hydrologic data, Input-output analysis, Reservoir operation, *South Carolina, *Reservoir operations.
Identifiers: *Lakes Marion-Moultrie reservoir(SC).

A stream-reservoir model was developed to simulate the operation of the Lakes Marion-Moultrie, South Carolina, reservoir system. The reservoir system is operated under the assumption of a 3-day prior knowledge of inflows. This information is attainable from the ooperational reservoir-inflow forecasting model developed in the Part I report. The model, developed for this part of the study, incorporates an inflow component, a diversion-canal component, and a reservoir system component and is capable of evaluating the performance of the reservoir systemem for a variety of operating rule conditions. All model components were verified using observed reservoir input and output data for a 6-year (1967-72 water years) period. In addition, a long-term 31-year simulation under present rule of operation was performed and the results summarized statistically. The model may be used for simulating other rule curves of operation for planning studies of reservoir system performance. (See also W75-05646) (Woodard-USGS)
W77-00488

THE BROADLEAF EVERGREEN FORESTS OF JAPAN, (IN GERMAN),
T. Suzuki.
Phytocoenologia. 2(3/4), p 293-300, 1975.

Descriptors: *Asia, *forests, Rain forests, Forest management.
Identifiers: *Broadleaf evergreen forests, *Evergreen forests, Fern, Ficus-retusa, Ficus-wightiana, *Japan, Liana, Machilus-thunbergii, Quercus-phillyraeoides, *Lawraceae, *Fagaceae.

Rainy climate continues from the subtropics northward to the cool-temperate region in Japan. The broad-leaved evergreen forests of Japan have many characteristics of the rain-forest, such as richness in lianas, epiphytes and ferns. The dominant genera, within which evergreen and deciduous species have differentiated during the climatic alternations since the Tertiary, are for the most endemic or have specified endemic taxa in Sino-Japanese Region. It is a unique character of this east Asiatic and southeast Asiatic broad-leaved evergreen forest that the Lauraceae and the Fagaceae grow in a community. Because the route of migration was 1 way, along the axis of the Archipelago, this class-group is monotypic with only 1 class, 1 order and 1 alliance. The alliance of Shiion sieboldii is the only one of the class-group that has reached the seashore. Shiion sieboldii comprises 4 suballiances. Suballiance of Quercion phylliraeoides is physiognomically a sclerophyllous forest, but it is floristically a suballiance of the Shiion sieboldii. Quercus phillyraeoides itself is a relict of the Tertiary warm zerophytic flora. In this suballiance the Lauraceae are separated from the Fagaceae. The typical suballiance has no clear character species for itself, but is the main part of the alliance. It is composed of 5 associations. Cyclobalanopsion stenophyllae develops near the upper limit of the alliance. It has 3 associations, among which the Aucubo-cyclobalapsetum stenophyllae is the only one differentiated under the snowy climate of the Japan sea coast. The last Machilion thunbergii is hygrophilous and shade-tolerant. In the south it is the most therm ophilous of the all suballiances; it forms subtropical stand near the boundary to the Ficus wightiana and F. retusa forests, but it is the suballiance that can attain the northernmost limit of the alliance, because Machilus thunbergii can utilized more efficiently the lateral light from the lower position of the sun and refraction from the sea surface.—Copuright 1976, Biological Abstracts, Inc.
W77-00499

WATER BALANCE OF STIPA PENNATA SPP. ERIOCAULIS, STIPA CAPILLATA AND FESTUCA VALLESIACE IN THE STEPPE REGION OF THE UPPER VINSCHAGAU, (IN GERMANY9,
For primary bibliographic entry see Field 2D.
W77-00505

4B. Groundwater Management

IMPACT OF LAND DISPOSAL OF SLUDGES ON GROUNDWATER,
Geraghty and Miller, Port Washington, N.Y.
For primary bibliographic entry see Field 5B.
W77-00031

A CASE STUDY OF CITIZEN PARTICIPATION IN RESOURCE PLANNING: THE CRAWFORD COUNTY CRITICAL RESOURCE INFORMATION WORKSHOP.
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6B.
W77-00171

NITROGEN IN SOIL CORES AND GROUND WATER UNDER ABANDONED CATTLE FEEDLOTS,
Agricultural Research Service, Lincoln, Nebr. Animal Waste Management Research Unit.
For primary bibliographic entry see Field 5B.
W77-00365

GEOLOGIC NITROGEN IN PLEISTOCENE LOESS IN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-00366

TOWARDS A COMPUTER-BASED INFORMATION-RETRIEVAL SYSTEM FOR GROUNDWATER DATA,
New Zealand Geological Survey, Christchurch.
For primary bibliographic entry see Field 7C.
W77-00377

HYDROGEOLOGIC DATA FROM THE GREAT BEND PRAIRIE, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
L. E. Stullken, and S. W. Fader.
Kansas Geological Survey, Lawrence, Basic-Data Series Ground-Water Release No 5, 1974. 50 p, 1 fig, 1 plate, 4 tab.

Descriptors: *Hydrologic data, *Groundwater resources, *Water quality, *Aquifer characteristics, *Well data, Hydrogeology, Water supply, Water yield, Water levels, Water users, Lithologic logs, Chemical analysis, Great Plains.
Identifiers: *Great Bend Prairie(Kans).

The investigation of the geology and ground-water resources of the Great Bend Prairie, an area of 5,400 square miles which includes all of Kingman, Kiowa, Pratt, Stafford, and parts of Barber, Barton, Edwards, Pawnee Reno, and Rice Counties, south-cental Kansas, was made during 1973-74. The study is part of the cooperative program between the Kansas Geological Survey and the U.S. Geological Survey, with data and support from the Division of Water Resources of the Kansas State Board of Agriculture and the Division of Environment of the Kansas State Board of Health and Environment. Records of 1,508 wells in the ten counties are presented. Included are 1,234 irrigation, 25 domestic or stock, 172 industrial or public supply, and 77 other wells. One hundred fifty-two chemical analyses of water from 148 representative wells are listed. Lithologic logs of 127 test holes also are included. (Woodard-USGS)
W77-00426

GROUND-WATER LEVELS IN THE UNITED STATES, 1970-74: SOUTH-CENTRAL STATES.
Geological Survey, Reston, Va.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, Va., 22202, price $2.50. Water-Supply Paper 2172, 1976. 172 p, 5 fig.

Descriptors: *Water leve's, *Groundwater, *Arkansas, *Louisiana, *Oklahoma, *Texas, Basic data collections, Water wells, Observation wells.
Identifiers: *South-central states.

Water-level measurements in this report of south-central states, for 1970-74, are given in feet with reference to either mean sea level or land-surface datum. Mean sea level is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The height of the measuring point above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month. (Woodard-USGS)
W77-00430

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1975.
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 7C.
W77-00435

EFFECTS OF NEAR-WELL PERMEABILITY VARIATION ON WELL PERFORMANCE,
New South Wales Univ., Kensington (Australia). Water Research Lab.
C. R. Dudgeon, and P. S. Huyakorn.
Australian Water Resources Council, Canberra, Technical Paper No. 18, 1976. 132 p, 52 fig, 23 ref, 4 append.

Descriptors: *Water wells, *Water yield, *Aquifers, *Permeability, Groundwater movement, Specific capacity, Drawdown, Pumping.

Field evidence has shown that the specific capacity of a pumped well can be greatly affected by permeability variations which occur in a zone immediately surrounding the well: for instance, by the invasion of drilling fluids to form a mud cake. A theoretical investigation is reported into the effect of such a phenomenon on the production capacity and drawdown of fully and partially penetrating wells which are screened in a confined aquifer. A method is presented for determining the average coefficient of permeability in the affected zone and the radial extent of the zone. Numerical solutions of several transient and steady flow cases were obtained using finite element analysis.

The results are presented in graphical form which enables a parametric study of dimenionless relationships to be conducted readily. Detailed tabulations of the results are given in appendices. (CSIRO)
W77-00437

DRILLING MUD INVASION OF UNCONSOLIDATED AQUIFER MATERIALS,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 8B.
W77-00438

GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1975,
Geological Survey, Austin, Tex.
R. A. Rappmund.
Edwards Underground Water District, San Antonio, Texas, Bulletin 35, July 1976. 7 p, 1 tab, 15 ref.

Descriptors: *Water yield, *Groundwater, *Limestones, *Aquifers, *Texas, *Water wells, *Springs, Data collections, Discharge(Water), Fluctuations, Annual.
Identifiers: *San Antonio area(Tex), *Edwards limestone(Tex).

The estimated total discharge from wells and springs in the Edwards and associated limestones in the San Antonio area, Texas, during 1975 was 868,200 acre-feet, which is the record high for the period 1934-75. The total discharge from wells and springs in 1975 was about 2 percent more than in 1974 and about 55 percent more than the average for 1934-74. About 38 percent of the total discharge was from wells, and approximately two-thirds of this amount was from wells in Bexar County. The discharge from wells in 1975 was 10 percent less than in 1974; springflow increased by about 12 percent. The discharge from springs was compiled from reports of gages operated by the U.S. Geological Survey at points of discharge. Pumpage for agriculture was estimated from records of power consumption and irrigated acreage. Records of the annual canvass of pumpage in the San Antonio area by the Texas Water Development Board were used to compile municipal, military and industrial usage. (Woodard-USGS)
W77-00479

DIGITAL SIMULATION OF A BASALT AQUIFER SYSTEM, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
R. D. Mac Nish, and R. A. Barker.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 44, 1976. 51 p, 19 fig, 1 plate, 3 tab, 14 ref.

Descriptors: *Model studies, *Aquifer systems, *Aquifer characteristics, *Pumping, Washington, Oregon, Water yield, *Water demand, Water utilization, Water levels, Transmissivity, Hydrogeology, Projections, Evaluation, Mathematical models, Computer models, River basins, *Simulation analysis, Groundwater.
Identifiers: *Walla Walla River basin(Wash-Oreg).

A digital (mathematical) model utilizing an alternating-direction implicit procedure simulates the hydraulic response to 72 years of pumping stress of a basalt aquifer system underlying the 1,758-square-mile Walla Walla River basin in Washington and Oregon. The modeled aquifer system is sandwiched between an underlying basalt-aquifer zone and an overlying aquifer zone composed of gravel and clay in the central lowland part of the basin and of basalt elsewhere. A water budget of the aquifer system before pumping stress began in about 1900 was computed by steady-state simulation. For this simulation the aquifer received 132,000 acre-feet of water per year, with 114,000 acre-feet entering from the principal recharge area, the Blue Mountains, on the southeastern border of the basin. Annual discharge rates were 97,500 acre-feet laterally to the Snake and Columbia Rivers and 34,500 acre-feet to adjacent aquifers, which also eventually drain to the two rivers. By 1945 pumping stress had reached about 5,000 acre-feet per year. A large increase in irrigation demand over the next 20 years increased the pumpage to 20,000 acre-feet per year and caused declines of as much as 135 feet from the 1900 water levels. Simulation of the effects of pumping indicated that by 1972 the water budget of the basalt aquifer system showed a net increase of flow from the recharge areas (6,500 acre-feet per year) and reduction in both lateral outflow (8,500 acre-feet per year) and discharge to adjacent aquifers (12,500 acre-feet per year). (Woodard-USGS)
W77-00481

DIGITAL-MODEL ANALYSIS TO PREDICT WATER LEVELS IN A WELL FIELD NEAR COLUMBUS, INDIANA,
Geological Survey, Indianapolis, Ind.
M. Planter.
Available from National Technical Information Service, Springfield, VA 22161 as PB-255 909/As, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 76-63, May 1976. 15 p, 7 fig, 1 tab, 4 ref.

Descriptors: *Model studies, *Water levels, *Projections, *Aquifer characteristics, *Groundwater resources, *Indiana, Digital computers, Water supply, Water demand, Drawdown, Well resources, *Indiana, Digital computers, Water supply, Water demand, Drawdown, Well spacing, Water table aquifers, Groundwater barriers, Hydrologic data, Hydrogeology.
Identifiers: Columbus area(Ind).

Columbus, Indiana, obtains its water supply from six municipally owned wells southwest of the city. The wells are screened in an outwash sand and gravel aquifer that was deposited by glacial melt water in a preglacial bedrock valley. The well field is midway between the East Fork White River and the western edge of the valley. A digital model was used to determine the effects of two pumping plans on the outwash sand and gravel aquifer. In pumping plan 1, a continuous pumping rate of 1,400 gallons per minute (gpm) for 10 years in each of the city's six existing wells was simulated with the model. Model results of plan 1 indicate that the water levels in the area of the well field would be lowered more than 20 ft and that drawdowns in the wells would approach 35 ft after 10 years' pumping. Pumping plan 2 had two stages of pumping. In the first, a continuous pumping rate of 1,400 gpm for 5 years in each of the city's six existing wells was simulated with the model; the second stage of pumping plan 2 differed from stage 1 only in that five planned wells were added to the six existing wells. Model results of plan 2 indicate that water levels in the area of the well field would be lowered as much as 40 feet. Drawdown at two of the well sites would approach 60 ft, leaving less than 15 ft of the initial 70 ft of saturated thickness at the two wells after 10 years' pumping. (Woodard-USGS)
W77-00482

GROUND-WATER DATA FOR ATTALA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W77-00484

GROUND-WATER QUALITY IN THE DAVIE LANDFILL, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-00486

CHANGES IN THE WATER SUPPLY IN THE UPPER REPUBLICAN NATURAL RESOURCES DISTRICT, SOUTHWEST NEBRASKA, FROM 1952-75,
Geological Survey, Lincoln, Nebr.
E. G. Lappala.
Open-file report 76-498, July 1976. 17 p, 4 fig, 1 tab, 4 ref.

Descriptors: *Groundwater resources, *Irrigation effects, *Drawdown, *Water levels, *Nebraska, Water supply, Water demand, Hydrologic data, Surface-groundwater relationships, Aquifer characteristics, Pumping, Groundwater recharge, *Water districts.
Identifiers: Southwest Nebraska, *Upper Republican Natural Resources Dist(Neb).

Use of ground water for irrigation has increased rapidly in the Upper Republican Natural Resources District in southwestern Nebraska in recent years. The principal aquifer being developed is composed of saturated and gravel of the Ogallala Formation of Tertiary age. Water-level declines of as much as 16 feet (4.9 meters) have occured. Base flow of major streams draining the aquifer was reduced by as much as 19 percent between 1967 and 1975. Recoverable ground water in storage was reduced by about 1 percent. New withdrawal of ground water in 1975 was about 250,000 acre-feet (308 million cubic meters), compared with estimated recharge from precipitation of 176,000 acre-feet (217 million cubic meters). Water levels and streamflow will continue to decline if ground-water withdrawals continue at or greater than the 1975. (Woodard-USGS)
W77-00489

ONE-DIMENSIONAL SIMULATION OF AQUIFER SYSTEM COMPACTION NEAR PIXLEY, CALIFORNIA: 2. STRESS-DEPENDENT PARAMETERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W77-00490

WATER QUALITY ASPECTS OF WELL RECHARGE WITH RECLAIMED WATER, BAY PARK, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5D.
W77-00492

4C. Effects On Water Of Man's Non-Water Activities

URBAN WATERSHED MANAGEMENT USING ACTIVITY INDICATORS TO PREDICT WATER QUALITY,
Carnegie-Mellon Univ., Pittsburgh, Pa. Environmental Studies Inst.
For primary bibliographic entry see Field 5A.
W77-00106

THE IMPACT OF MAN ON THE WORLD NITROGEN CYCLE,
Purdue Univ., Lafayette. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5A.
W77-00312

EROSION AND RUNOFF ON FOREST AND RANGE LANDS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
R. O. Meeuwig, and P. E. Packer.
In: Proceedings of the Fifth Workshop of the United States/Australia Rangelands Panel, June 15-22, 1975, Boise, Idaho. Utah Water Research Laboratory, Utah State University, Logan, Utah,

Report INT R-443, p 105-116, March, 1976. 3 fig, 3 ref.

Descriptors: *Erosion, *Runoff, *Forest watersheds, *Ranges, *Lumbering, *Road construction, *Grazing, *Mining, Recreation, Forest fires, Burning, Surface runoff, *Range management, *Forest management.
Identifiers: *Surface mining.

This report discusses logging, road construction, grazing, surface mining, and recreation as these major uses affect erosion and runoff on forest and range lands. Fire is also discussed because it greatly affects erosion and runoff. (Witt-IPC)
W77-00332

THE EFFECT OF HUMANS ON BIOGEOCENOSES AND ENVIRONMENTAL PROTECTION, (IN RUSSIAN),
For primary bibliographic entry see Field 6G.
W77-00412

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON FISHKILL CREEK, FISHKILL, NEW YORK,
Geological Survey, Albany, N.Y.
T. J. Zembrzuski, Jr., and B. Dunn.
Open-file report 76-595, August 1976. 8 p, 3 fig, 3 tab, 5 ref.

Descriptors: *Flood flow, *Bridge design, *Backwater, *Flood recurrence interval, *Flood discharge, Engineering structures, Bridge construction, Hydrologic data, Evaluation, Planning, New York, Flood frequency, Flood profiles.
Identifiers: *Fishkill Creek(NY).

An evaluation of floodflow characteristics of Fishkill Creek at the proposed bridge site at Fishkill, N.Y., was made for the 50- and 100-year floods. The flood-frequency analysis revealed that the magnitude of the 50- and 100-year floods are 8,000 cubic feet per second (cfs) and 10,000 cfs, respectively. The normal water-surface elevation at the approach cross section was determined by the slope-conveyance method to be 209.8 feet during a 50-year flood and 210.8 feet during a 100-year flood. Also included is an analysis of the effect of the existing bridge and of two alternative bridge designs on the profiles of floods having recurrence intervals of 50 and 100 years. (Woodard-USGS)
W77-00483

AN OVERVIEW OF URBAN SEDIMENTOLOGY,
Geological Survey, Reston, Va.
H. P. Guy.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control: Proceedings of Symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, Kentucky University, Office of Research and Engineering Services, p 149-159, October 1974. 8 fig, 15 ref.

Descriptors: *Sediment transport, *Urbanization, *Storm runoff, *Construction, *Soil erosion, Channel erosion, Erosion control, Methodology, Urban hydrology, Sedimentology, Sediment yield, Runoff.

Urban sedimentology implies all theoretical, scientific, analytical, and philosophical studies of particulate matter moved, or likely to be moved, by water, wind, ice, gravity, or man in an existing or developing urban area. More commonly, however, urban sedimentology is concerned with (1) spatial and temporal erosion of soils in construction areas, (2) the nature of the movement and impact of sediments in construction areas and in water bodies downstream, (3) methods for mitigating erosion and sediment movement, and (4) channel erosion downstream where flows have increased as a result of increased imperviousness from urbanization. Minimizing sediment problems in an urban development area begins with sound land use and structure design, then makes use of practical vegetative controls on as much of the site as possible, for as much time as possible to prevent erosion and trap sediment; and then makes use of physical controls to slow runoff and trap sediment. Such controls must be applied with specific criteria as to their needs and effectiveness; that is, the reduction in damages must exceed the cost of application. (See also W76-09729) (Woodard-USGS)
W77-00491

4D. Watershed Protection

ENGINEERING STUDY AND FIELD DEMONSTRATION TRIALS FOR SAND DUNE STABILIZATION,
Ward (George D.) and Associates, Portland, Oreg.
For primary bibliographic entry see Field 5E.
W77-00032

MORPHOLOGY OF COBBLE STREAMS IN SMALL WATERSHEDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-00089

GUIDELINES FOR SEDIMENT CONTROL IN IRRIGATION RETURN FLOW,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 5G.
W77-00090

GULLY DEVELOPMENT AND CONTROL: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2J.
W77-00097

TRI-STATE CONFERENCE REPORT: METHODS FOR BEACH AND SAND DUNE PROTECTION,
Georgia Dept. of Natural Resources, Atlanta.
In: 'Methods for Beach and Sand Dune Protection', March 31-April 2, 1974, Jekyll Island, Ga. 48 p, 6 fig.

Descriptors: *Erosion control, *Shore protection, *Beaches, *Dunes, Sands, Georgia, North Carolina, South Carolina, Conferences, Barrier islands, Stability, Methodology, Seashores, Governmental interrelations, Vegetation, Barriers, Costs, Land use, Legislation, Social participation, Planning, *Southeast US.

A conference of representatives from Georgia and North and South Carolina, discussed the importance of the natural beach and sand dune system; typical features of a Georgia barrier island; role of dunes in shoreline stability; energy of the tide and its effect on the coastal zone; critical areas in the shore zone of some Georgia islands; ecological consequences of barrier island migration and management in North Carolina; and coastal processes at Tybee Island, Georgia (an eroding barrier island); stabilizing of coastal dunes; beach erosion control in South Carolina; beach stabilization with experimental nylon bag groins; role of a local citizen commission in dune protection; inter-governmental cooperation for dune protection at Savannah Beach, Georgia; federal interest in beach and dune protection; role of citizens in sand dune protection; criteria for successful beach erosion control projects; and intergovernmental cooperation for beach and sand dune protection. It was pointed out that beaches and sand dunes are fragile systems requiring careful management and must be understood to be controlled. Too often costs and benefits have not been measured before undertaking projects. Protection is the joint responsibility of local, state, and federal governments, in which citizens have an important role to play. (Buchanan-Davidson-Wisconsin).
W77-00193

CATCHMENT MODELING AND INITIAL PARAMETER ESTIMATION FOR THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM,
National Weather Service, Washington, D.C. Office of Hydrology.
For primary bibliographic entry see Field 2A.
W77-00272

ECONOMIC IMPACTS OF STATE ENVIRONMENTAL PROGRAMS IN A NATIONAL FRAMEWORK: THE IOWA CONSERVANCY LAW,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 6G.
W77-00303

EROSION AND RUNOFF ON FOREST AND RANGE LANDS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W77-00332

GEOMORPHOLOGICAL MAPPING APPLIED TO SOIL EROSION EVALUATION,
National Inst. of Agricultural Engineering, Silsoe (England).
For primary bibliographic entry see Field 2J.
W77-00369

FACTORS AFFECTING SPRING RUNOFF ON TWO FORESTED WATERSHEDS,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2E.
W77-00374

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1975,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2J.
W77-00433

IOWA'S EXPERIENCE WITH A MANDATORY SEDIMENT CONTROL LAW,
Iowa Dept. of Soil Conservation, Des Moines.
For primary bibliographic entry see Field 6E.
W77-00477

SEDIMENT DISCHARGE IN THE UPPER ARROYO GRANDE AND SANTA RITA CREEK BASINS, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W77-00487

AN OVERVIEW OF URBAN SEDIMENTOLOGY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4C.
W77-00491

STUDY OF THE EROSION STABILITY OF THE PLOW LAYERS OF GRAY FOREST SOILS OF THE NORTHERN FOREST-STEPPE, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.

M. S. Kuznetsov, V. Ya. Grigor'ev, E. G. Aleksandrova, and G. P. Glazunov.
Biol Nauki. 18(2), p 122-126, 1975.

Descriptors: *Forest soils, Gray-Brow podzolic soils, *Analytical techniques, Mathematical studies, *Erosion, Slope stability, *Erosion control, Grasslands.
Identifiers: Steppes, USSR.

The erosion stability of the gray forest soils of the right-bank region of the Oka River, USSR, which are subjected to intense processes of slope erosion was evaluated by means of the values of the permissible (noneroding) water-flow velocities, i.e., the flow velocities at the height of the projections of the channel bed not causing erosion. An equation is derived for calculating the permissible flow velocities. The data obtained can be used for forecasting slope erosion and for developing antierosion measures.—Copyright 1975, Biological Abstracts, Inc.
W77-00514

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CHARACTERISTICS OF RURAL HOUSEHOLD WASTEWATER,
Wisconsin Univ., Madison. Small Scale Waste Management Project.
R. Siegrist, M. Witt, and W. C. Boyle.
Journal of the Environmental Engineering Division-ASCE, Vol. 102, No. EE3, p 533-548, June, 1976. 3 fig, 17 tab, 15 ref.

Descriptors: *Domestic water, *Domestic wastes, *On-site investigations, Water requirements, Biochemical oxygen demand, Suspended solids, Nitrogen compounds, Phosphorus compounds, Microorganisms, Disinfection, Water reuse, *Pollutant identification.

Water use was monitored at 11 rural homes for about a month and waste water quality was monitored at three of the residences. Water usage yielded an average flow of 42.6 gallons/capita/day. Laundry, bath/shower, toilet flushings, dishwashing, water softener use, and other events accounted for the following percentages of water use: 24.7%, 23.5%, 21.5%, 11.4%, 6.2%, and 12.7%, respectively. The average daily contributions of biochemical oxygen demand, suspended solids, total nitrogen, and total phosphorus were 0.109, 0.77, 0.013, and 0.009 pounds of pollutant/capita/day, respectively. Bacteriological analyses indicated wide variation in indicator organisms and the possibility of pathogenic organisms in bath and laundry waste waters. Therefore, disinfection of these prior to reuse is recommended. (Kreager-FIRL)
W76-00048

PROCEEDINGS OF THE 1975 NATIONAL CONFERENCE ON MUNICIPAL SLUDGE MANAGEMENT AND DISPOSAL.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5D.
W77-00009

ENVIRONMENTAL EFFECTS OF SLUDGE DISPOSAL IN SANITARY LANDFILLS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5C.
W77-00030

BIOASSAY PROCEDURES FOR THE OCEAN DISPOSAL PERMIT PROGRAM,
Environmental Protection Agency, Gulf Breeze, Fla. Environmental Research Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 209, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/9-76-010, May, 1976. 106 p, 9 fig, 12 tab, 87 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Bioassay, *Oysters, *Algae, Marine fish, Crustaceans, Brine shrimp, Waste disposal, Toxicity.
Identifiers: *Ocean Disposal Permit Program(EPA).

Bioassay procedures are given which were developed to provide tests for conducting toxicity evaluations of waste materials considered for ocean disposal under the Environmental Protection Agency's (EPA) Ocean Disposal Permit Program. Three of the nine bioassay procedures described, the oyster shell growth procedure, the chronic fish egg-to-egg procedure, and the acetylcholinesterase inhibition test, are not recommended for routine use. At least three species from different taxonomic groups and representing several trophic levels should be used in evaluating a dumping permit. The procedures include both flow-through and static tests. The methods vary in their utility and complexity of performance. The procedures are not intended to be 'standard methods' but as guides for those involved in evaluating ocean dumping permits. (Snyder-FIRL)
W77-00041

TRACE ORGANIC COMPONENTS AS FINGERPRINTS IN GAS CHROMATOGRAPHIC IDENTIFICATION OF SPILLED ASPHALTS,
Environmental Monitoring and Support Lab., Cincinnati, Ohio.
F. K. Kawahara.
Environmental Science and Technology, Vol, 10, No. 8, p 761-765, August 1976. 8 fig, 3 tab, 15 ref.

Descriptors: *Water pollution, *Pollutant identification, *Asphalt, *Gas chromatography, Organic compounds, Spectroscopy, Pollutants, Pollution, Path of pollution, Path of pollutants, Pollution sources, Rivers, Chemistry, Chemical analysis, Tracers.
Identifiers: Pentafluorobenzyl derivatives.

The development and testing of a new concept for oil identification this past year made possible the successful application of gas chromatography to the analysis and identification of asphalts. Through the use of electron capture detection-gas chromatography, the passively labeled pentafluorobenzyl thioethers and ethers which are derivatives of weak acids present in trace amounts in discharged heavier petroleum products were separated, and the resulting chromatograms served as fingerprints for identification. (Sims-ISWS)
W77-00085

ASSOCIATIONS OF CHLORINATED HYDROCARBONS WITH FINE PARTICLES AND HUMIC SUBSTANCES IN NEARSHORE SURFICIAL SEDIMENTS,
University of Southern California, Los Angeles. Environmental Engineering Program.
W. W. Choi, and K. Y. Chen.
Environmental Science and Technology, Vol. 10, No. 8, p 782-786, August 1976. 6 fig, 4 tab, 34 ref. Army DACW39-74-C-0077.

Descriptors: *Chlorinated hydrocarbon pesticides, *Sediments, *Pollutant identification, Sampling, Laboratory tests, Pesticides, Organic pesticides, Organic compounds, DDE, DDD, DDT, Polychlorinated biphenyls, Aroclors, Particle size, Humus, Fulvic acids, Pollutants, Water pollution, Harbors, Sewage effluents, Outfall sewers.

Sediment samples from Los Angeles Harbor along the Terminal Island sewer outfall to the breakwater entrance were collected. Upon extrusion from cores, these sediment samples were sealed in plastic bags and stored in ice at 4 C for transport to the laboratory, where the well-mixed subsamples were transferred into an airtight plastic container in a glove bag under a nitrogen atmosphere. The samples were stored in a refrigeration unit at approximately 4 C until used. The homogenized sediment from each station was split into three fractions to be extracted and/or analyzed for humic and fulvic acids, chlorinated hydrocarbons, and particle size. It was found that: p,p'DDE generally accounts for 60-70% of the total chlorinated hydrocarbon content in sediment, whereas PCB's (mostly Arochlor 1254) constitute almost 10-20% of the total. Other isomers of DDT and dieldrin account for the remaining fraction. Concentrations of chlorinated hydrocarbons are closely related to the organic contents and to particles of 8 micrometers or less in size. Total organic carbons of sediments as well as fulvic and humic acid fractions bear a linear relationship with respect to concentrations of chlorinated hydrocarbons in sediments. Total chlorinated hydrocarbon contents of sediments studied range from 0.3 to 3.5 ppm, whereas total organic carbon contents range from 0.45 to 1.70% on a dry weight basis. (Sims-ISWS)
W77-00086

RESPIROMETRIC DETERMINATION OF BOD,
Birmingham Univ., (England). Dept. of Civil Engineering.
T. H. Y. Tebbutt, and M. Berkun.
Water Research, Vol. 10, No. 7, p 613-617, 1976. 5 fig, 3 tab, 11 ref.

Descriptors: *Pollutant identification, *Biochemical oxygen demand, *Organic matter, *Instrumentation, *Oxygen demand, Oxygen, Water properties, Dissolved oxygen, Eutrophication, Water pollution, Water quality, Chemistry, Analytical techniques, Chemical analysis, Organic wastes, Properties, Dissolved oxygen analyzers, Graphical analysis, Mathematical models.
Identifiers: *Respirometers, Gilson respirometers, Warburg respirometers, Large volume respirometers.

Oxygen uptake data obtained from a simple large volume respirometer have shown good correlation with conventional BOD data. The effect of carbon dioxide deficiency was found to be of some significance in respirometric work. (Henley-ISWS)
W77-00095

URBAN WATERSHED MANAGEMENT USING ACTIVITY INDICATORS TO PREDICT WATER QUALITY,
Carnegie-Mellon Univ., Pittsburgh, Pa. Environmental Studies Inst.
W. P. Darby, F. C. McMichael, and R. W. Dunlap.
Water Resources Research, Vol. 12, No. 2, p. 245-252. April 1976. 1 fig, 18 ref, 6 tab.

Descriptors: *Water quality, *Water quality control, *Water management(Applied), *Watersheds(Basins), *Indicators, Land use, Urbanization, Waste disposal, Cities, *Pollutant identification.
Identifiers: Federal Water Pollution Control Act of 1972, Discriminant analysis technique, Activity indicators, Stream potential.

The 1972 Federal Water Pollution Control Act amendments (public law 92-500) established water quality goals and proposed methodology appropriate for major rivers. The role of small urban watersheds which drain into a small stream which eventually joins a large urban river was studied using fifty-two small watersheds in Allegheny County (PA). Three data bases were sought: stream sampling data, perceived water quality data and watershed data. Stream sampling data included pH, dissolved oxygen, total coliform, tota

dissolved solids, total iron and temperature. Experts were asked to analyze water quality by perception, rating streams on a scale of 1 to 5 from poor to excellent quality. Sixteen indicators were used to predict actual stream qualty for watersheds for which no direct stream quality measures exist. The 16 indicators were subdivisions of 7 principal activities, including municipal waste disposal, solid waste disposal, urbanization, acid mine drainage, industrial waste disposal, siltation and stream potential. The discriminant analysis technique was employed to relate activity indicators to actual water quality. The concept of activity indicators is valuable when data are sparse, disaggregate or discontinuous in nature, or when an agency does not have the funds for extensive monitoring programs. With limited sampling data, indicators of watershed characteristics may be used to estimate overall water quality of a stream and predict individual problem parameters. Local authorities may therefore participate more fully in management of small urban watersheds. (Gentry-North Carolina)
W77-00106

BIOLOGICAL ASSESSMENT OF WATER QUALITY IN THREE BRITISH RIVERS: THE NORTH ESK (SCOTLAND), THE IVEL (ENGLAND) AND THE TAF (WALES),
Aston Univ., Birmingham (England). Dept. of Biological Sciences.
D. Balloch, C. E. Davies, and F. H. Jones.
Water Pollution Control, Vol. 75, No. 1, 1976. p 92-114. 9 fig, 18 ref.

Descriptors: Indexing, Documentation, *Data processing, *Water quality, *Benthic communities, Methodology, Testing procedures, Habitats, Sampling, Effluent, Bioassay, *Pollutant identification.
Identifiers: *Trent biotic index, *Chandler's score system, *Kothe's species deficit, *Graham's biotic index, *Community diversity index, *Benthic macro-invertebrates, North Esk River(Scotland), Ivel River(England), Taf River(Wales), Riffle habitat.

Data processing methods are compared and evaluated. Individual biological surveys were carried out on 3 British rivers: North Esk, Ivel and Taf. Benthic communities were used as an index or summary indicator reflecting ecological conditions caused by effluent discharge. Parameters varied between rivers, but included: temperature, pH, specific conductance, dissolved oxygen (DO), biological oxygen demand (BOD), nitrite, nitrate, total hardness, alkalinity, chloride, phosphate, sulphate, velocity of water flow and nature of substream, among others. Benthic macro-invertebrates were chosen as most suitable organisms for assessing water quality. The riffle habitat was chosen for collection of samples because of the large number of microhabitats and presence of most macro-invertebrate species sensitive to water quality deterioration. Two sampling techniques were used: the heel-kick and stop net method, and a cylindrical core sampler (modification of the Neill design) to test the substratum. Data were collected into several numerical indexes and then compared to assess their value as criteria of water quality. The indexes were: the Trent biotic index, Graham's biotic index, the Community diversity index, Chandler's score system and Kothe's species deficit. The physical-chemical results in all 3 rivers were that sewage effluent produced elevated concentrations of nitrate, nitrite, ammonia, synthetic detergents, SS, BOD and reduced DO concentrations. The biological analysis compared sensitivity to changes in water quality, effect of sampling habitat and other factors concluding that the Chandler's score system was most appropriate as a water quality index. (Gentry-North Carolina)
W77-00108

OPTIMIZATION OF STATE WATER QUALITY MONITORING SYSTEMS,
Environmental Research Lab., Corvallis. Oreg.
For primary bibliographic entry see Field 5G.
W77-00120

A PHOSPHORUS RESIDENCE TIME MODEL: THEORY AND APPLICATION,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5B.
W77-00124

CARCINOGENIC NITROSAMINES AND THEIR PRECURSORS IN FRESH AND POLLUTED WATERS,
Cornell Univ Agricultural Experiment Station, Ithaca, N. Y. Dept. of Agronomy.
M. Alexander.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 778, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, September 1976. 24 p, 15 tab. OWRT A-055-NY(1). 14-31-0001-5032, 14-34-0001-6033.

Descriptors: *Pollutant identification, Methodology, Analytical techniques, *Gas chromatography, Separation techniques,
Identifiers: *Nitrosamines, Dialkylnitrosamines, Carcinogens, Nitroso compounds, *Amines.

A series of methods was developed and tested for the analysis of nitrosamines that might be present in natural water. Initially, the recovery of added nitrosamine in distilled water was quite poor. In sewage amended with nitrosamines, recovery of dimethyl and diethylnitrosamines was low although recovery of two other nitrosamines was greater than 75%. Using an Amberlite resin, the recovery of nitrosamines added to lake water ranged from 24 to 53% for diethylnitrosamine and from 65 to 97% for other nitrosamines. Recoveries of diethylnitrosamine with Amberlite were higher when this carcinogen was added to sewage. However, when nitrosamines in water were trapped on activated carbon, the nitrosamine recovery ranged from 89 to 116%, regardless of the nitrosamine tested. Recovery of these compounds by steam distillation was not as high. A method was finally devised which permitted recovery of nitrosamines from water containing parts per billion levels. In these investigations, gas chromatographic techniques were employed for detection.
W77-00146

REMOTE DETECTION OF WATER POLLUTANTS BY COMPUTERIZED LASER-RAMAN SPECTROSCOPY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
C. W. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 777, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, (1976). 29 p, 10 fig, 3 tab, 7 ref. OWRT A-054-RI(1).

Descriptors: *Pollutant identification, *Spectroscopy, Water pollution, Chemicals, *Remote sensing, Data processing.
Identifiers: *Laser raman spectroscopy, *Hazardous chemicals.

Hazardous chemicals in water have been analyzed remotely and by conventional instrumentation using a digitized Raman spectrometer. Several data processing methods were explored in order to lower the level of detectability. Furthermore, the feasibility of using the resonance Raman effect to lower the level of detectability was investigated. It is possible to detect many hazardous chemicals in the 1-10 ppm range using either data processing or the resonance Raman effect.
W77-00154

ASSESSMENT OF PRACTICALITY OF REMOTE SENSING TECHNIQUES FOR A STUDY OF THE EFFECTS OF STRIP MINING IN ALABAMA,
Alabama Univ., University. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5C.
W77-00170

ISOLATION AND IDENTIFICATION OF BLUE-GREEN ALGAE PRODUCING MUDDY ODOR METABOLITES, GEOSMIN, AND 2-METHYLISOBORNEOL, IN SALINE LAKES IN MANOTOBA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. L. Tabachek, and M. Yurkowski.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 1, p. 25-35, 1976. 7 fig., 1 tab., 56 ref.

Descriptors: *Odor-producing algae, *Cyanophyta, *Saline lakes, Water pollution sources, *Canada, Fish, *Pollutant identification.
Identifiers: *Geosmin, Methylisoborneol, Manitoba(Canada), Oscillatoria, Lyngbia, Symploca muscorum, Muddy odor, Lacquer odor.

Rainbow trout farmed in the saline lakes of southwestern Manitoba developed a muddy flavor which was attributed to geosmin and/or 2-methylisoborneol produced by blue-green algae. The algae producing geosmin were Oscillatoria cf. prolifica, 0. tenuis, 0. cf. cortiana, 0. cf. variabilis, 0. agardhii, 0. splendida, 0. sp. Symploca cf. muscorum, Lyngbya cf. aestuarri, and L. sp. Lyngbya cf. cryptovaginata, the latter the first alga reported to produce 2-methylisoborneol, an odor resembling lacquer. Actinomycetes or other bactria were not detected in these lakes. It was found that 0. splendida, 0. prolifica, 0. cortiana, and Lyngbya aestuarri produced the most geosmin--approximately four times more than 0. tenuis and Symploca muscorum, 20 times more than 0. agardhii, and 50 times more than 0. variabilis. Indentifical growth, extraction, and gas chromatographic analytical conditions were used. The algae that produce geosmin may grow throughout all of part of the year; certain Ocillatoria and Lyngbya species tend to occur in higher numbers or even become dominant in polluted, high organic content, or fertilized water. Previous reports of planktonic blooms of 0. prolifica and 0. agardhii have shown to produce geosmin. Sediment blooms of 0. limosa, 0. princeps, 0. splendida, and 0. tenuis have also been reported as odor producers. (Auen-Wisconsin).
W77-00185

DEPOSITION OF AIRBORNE MERCURY FROM SIX SWEDISH CHLOR-ALKALI PLANTS SURVEYED BY MOSS ANALYSIS,
Swedish Water and Air Pollution Research Lab., Goteborg.
T. Wallin.
Environmental Pollution, Vol. 10, p. 101-114, 1976. 8 fig., 2 tab., 11 ref.

Descriptors: *Mercury, *Air pollution, *Industrial wastes, *Analytical techniques, *Mosses, Fallout, Spatial distribution, Europe, *Pollutant identification, Path of pollutants.
Identifiers: *Sweden, Hypnum cupressiforme, Chlor-alkali industry.

Local contamination by airborne mercury from six Swedish chlor-alkali plants was studied by analyzing mercury accumulated in moss. Samples of the carpet-forming moss, Hypnum cupressiforme, were collected from a 15 km radius around each plant and the dry moss mercury contents were measured by neutron activation analysis. The highest mercury levels were found near the plants. As distance from the plants increased. Between 9-15 km from the plants, the background mercury level of the area was reached. Annual fall-out esti-

mates indicated that only a minor part of emitted mercury was deposited locally. The mercury was spread over very large areas and probably contributed to global circulation and regional background deposition. These results confirmed those obtained by the snow-sampling method. The moss-sampling method indicated that a larger area was affected by mercury deposition and that local fall-out was a larger fraction of the total emission volume, perhaps due to seasonal variations in mercury transport and fluctuations in emission due to temperature. Moss analysis can be used to survey local mercury contamination from the atmosphere, but the method needs improvement. (Buchanan-Davidson–Wisconsin)
W77-00186

ALGAL PRODUCTIVITY IN 49 LAKE WATERS AS DETERMINED BY ALGAL ASSAYS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-00187

THE EXTRA O2 EVOLVED DURING NITRATE UTILIZATION BY CHLORELLA,
Centre d'Etudes Nucleaires de Cadarache, Saint Paul-lez-Durance (France). Department de Biologie.
For primary bibliographic entry see Field 5C.
W77-00191

LOS ANGELES HARBOR FIELD INVESTIGATION OF OIL AND BACKGROUND LUMINESCENCE SIGNATURES,
McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
H. G. Gross.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-016 466, Price codes: A06 in paper copy, A01 in microfiche. U.S. Coast Guard Final Report No. USCG-D-154-75, May 1975. 118 p, 42 fig, 11 tab, 17 ref. DOT-CG-51998-A.

Descriptors: *Oil pollution, *Water pollution sources, *Aromatic compounds, *Remote sensing, *Resources development, California, Harbors, Continental Shelf, Gas chromatography, Mass spectrometry, Reflectance, Ultraviolet radiation, Pollutant identification.
Identifiers: *Outer Continental Shelf, Grease, Luminescence, Sky scattered daylight, Signatures, Lasers.

The USCG Program was intended to provide a first look at the possible background signatures, their relevance to site water constituents, and their possible interference with oil signatures when using a remote sensing laser fluorosensor system in an actual harbor. Specifically, the USCG Program was to obtain, by remote sensing from a ground based laser fluorosensor system, laser induced luminescence signatures of the seawater at the one channel and five harbor sites. The signatures are similar, indicating dominance by one or more common constituents. The peak at about 4500A and shape of the signature suggest dominance by heavier aromatics, probably by oil and grease, among the principal pollutants. Gas chromatograph-mass spectrometer analyses of site samples show light and heavy constituents, some of which are aromatics. Luminescence signatures of light, medium and heavy oils were established as measurable against the strong water luminescence background. Reflectance signatures of oil films on water indicate a luminescent component due to sky scattered daylight and direct sun UV irradiation. Multispectral photography provided a few examples of site supportive information. (Sinha-OEIS)
W77-00197

THE USE OF ERTS-1 TO MORE FULLY UTILIZE AND APPLY MARINE STATION DATA TO THE STUDY AND PRODUCTIVITY ALONG THE EASTERN SHELF WATERS OF THE UNITED STATES,
Old Dominion Univ. Research Foundation, Norfolk, Va.
H. G. Marshall, D. E. Bowker, and W. G. Witte.
Available from the National Technical Information Service, Springfield, VA 22161 as N-76-18588, Price codes: A03 in paper copy, A01 in microficche. Old Dominion University Research Foundation Final Report prepared for Goddard Space Flight Center, February 1976. 49 p, 10 fig, 15 tab, 6 ref. NAS5-21816.

Descriptors: *Chlorophyll, *Phytoplankton, *Remote sensing, *Sediments, *Suspended solids, *Oceanographic data, *Monitoring, *Productivity, Continental Shelf, Satellites(Artificial), Temperature, Salinity.
Identifiers: *Outer Continental Shelf, *Sea truth data, *Pelagic areas, U.S. East Coast, Chesapeake Bay, Radiance, Nearshore waters, Western North Atlantic Ocean, ERTS-1.

Sea truth data was obtained during two ERTS overpasses in waters near the entrance of the Chesapeake Bay. Correlations were made between total phytoplankton and chlorophyll values in these waters to radiance detected by ERTS in an effort to map areas of similar productivity levels. Band 4 radiance had the highest correlation to all parameters with bands 5 and 6 showing decreasing correlations in each case. The radiance values were apparently influenced by one or more factors, most likely including the sediment content of the water. The data have shown that ERTS MSS is not suitable for monitoring chlorophyll in nearshore waters where sediment loads are high. It is suggested that in more seaward or pelagic locations, that ERTS MSS would be more efficient in monitoring surface chlorophyll values and establishing direct relationships to phytoplankton concentrations. (Sinha-OEIS)
W77-00198

TAGGING OIL-RESIDUES IN TANKERS WITH MICROPARTICLES,
Swedish Investigation Committee for Methods of Tagging Oil in Ships, Stockholm.
P. O. Agnedal.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 87-90, 1 tab, 1 ref.

Descriptors: *Monitoring, *Oil pollution, *Oil spills, *Pollution abatement, Tagging, Transportation, Water quality control, *Pollutant identification.
Identifiers: *Detection, Tankers, Residues, Microparticles, Sweden, Baltic Sea.

The increase in pollution by oil spills in the Baltic has led to the Minister of Transport to set up a committee with the task to find methods for identifying ships responsible for oil spills. A preliminary study of the oil transport situation in Sweden had shown that the fingerprint method for identification will be difficult to use. The study also showed that microparticles of plastic and metal as tags might be used. In most cases the oil spills in the Baltic are due to pumping out residues mixed with ballast. In this paper the merits of different methods for tagging these residues, including the cost aspect, are treated as well as identification of recovered oil samples. In a field experiment the oil residues in a tanker were tagged. Some of its tanks were tagged with plastic particles and some with metal particles. The tanks were treated in different ways for cleaning and the oil-water mixtures were then pumped out in the sea under controlled conditions. The different spills were kept inside an enclosure for a fortnight and samples were taken every day. In all analysed samples the tagged substance could be recovered and identified. (See also W76-09312) (Sinha-OEIS)
W77-00211

THE DEVELOPMENT OF AN EXPERIMENTAL AIRBORNE LASER OIL SPILL REMOTE SENSING SYSTEM,
Transportation Systems Center, Cambridge, Mass.
J. F. Fantasia, and H. C. Ingrao.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 101-115, 19 fig, 1 tab, 17 ref. append.

Descriptors: *Remote sensing, *Oil spills, *Oil pollution, *Pollution abatement, Water pollution, Fluorescence, Laboratory tests, Optics, Sea water, Equipment, Instrumentation, Monitoring, Resources, Pollutant identification.
Identifiers: *Outer Continental Shelf, Airborne lasers.

An experimental airborne laser oil spill remote sensing system has been developed. Operating from a U.S. Coast Guard Search and Rescue Aircraft, the system is expected to have the capability of remote detection, coarse oil classification (heavy, medium and light weight) and under certain conditions quantification of oil spills in the marine environment. The system concept is based on a recent investigation at TSC of laser stimulated oil fluorescence as a technique for the remote sensing of oil spills, including laboratory and field measurements. The development and laboratory tests results of the experimental system are described. (See also W76-09312) (Sinha-OEIS)
W77-00213

VOLUMETRIC DETERMINATION OF MARINE OIL SPILLS USING COORDINATED AIRBORNE AND SURFACE SAMPLING DATA,
California Univ. Santa Barbara.
J. E. Estes, P. G. Mikolaj, R. R. Thaman, and L. W. Senger.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 117-125, 9 fig, 3 tab, 3 ref. DOT-CG-23260-A; SG-2-35208.

Descriptors: *Oil pollution, *Oil spills, *Water pollution, *Remote sensing, *Pollution abatement, *Volumetric analysis, Sampling, Films, Monitoring, Sampling.
Identifiers: *Outer Continental Shelf, Airborne measurement, Ground truth.

The detection, measurement, and monitoring of oil pollution in the marine environment are receiving increased attention owing to: (1) the growing incidence of oil spills; (2) the associated need for improved cleanup procedures; and (3) the need for more effective surveillance systems, capable of gathering legal evidence for the prosecution of violators. The Geography Remote Sensing Unit and the Department of Chemical and Nuclear Engineering at the University of California, Santa Barbara for 2 1/2 years has been conducting experiments related to the application of remotely sensed data to these problem areas. As part of a United States Coast Guard test of a high seas oil containment device, a system for estimating the volume of oil loss resulting from oil pollution incidents was developed. This system involved the coordination of remote sensing data acquisition with simultaneous collection of surface sampling data. Results indicate that remotely sensed data, when effectively correlated with surface sampling data, can provide a base for volumetric estimations of a given oil slick. Refinements of these techniques can lead to more efficient, real-time day/night, operational monitoring of marine oil pollution incidents. (See also W76-09312) (Sinha-OEIS)
W77-00214

DEVELOPMENT OF U.S. COAST GUARD PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM,
Coast Guard, Washington, D. C.; and Aerojet Electrosystems Co. Azusa, Calif.

R. J. Ketchel, and A. T. Edgerton.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 127-137, 5 fig, 4 tab, 7 ref.

Descriptors: *Oil spills, *Oil pollution, Water pollution, Sea water, *Monitoring, *Remote sensing, Mapping, Equipment, *Pollutant identification.
Identifiers: *Outer Continental Shelf, Detection, Surveillance, Airborne equipment, Sensors, Multispectral sensors, Microwave radiometric imager.

The U.S. Coast Guard has contracted with the Aerojet Electrosystems Company, a Division of Aerojet-General Corporation, for the design, development and fight test evaluation of a prototype Airborne Oil Surveillance System. This system as conceived will utilize multispectral sensors to provide for the day/night all-weather airborne detection, mapping and documentation of oil spills at sea. The sensors used in this system will operate from the ultraviolet to the microwave region of the electromagnetic spectrum. This paper describes the development of this Airborne Surveillance System including the sensor mix and their relationship to the oil pollution surveillance mission. In addition the operational mission and system performance requirements used to define the system is considered. This prototype system will be ready for flight test evaluation by early 1974. (See also W76-09312) (Sinha-OEIS)
W77-00215

REMOTE SAMPLER FOR DETERMINING RESIDUAL OIL CONTENT OF SURFACE WATERS,
Naval Ship Research and Development Center, Annapolis, MD.
P. Schatzberg, and D. F. Jackson.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 139-144, 3 fig, 6 tab, 2 ref.

Descriptors: *Surface waters, *Oil spills, *Oil pollution, Water pollution, *Water pollution sources, *Water quality control, Monitoring, *Sampling, Coasts, Estuaries.
Identifiers: *Outer Continental Shelf, Residual oil, Sorbent.

A simple flow-through device has been developed which, in conjunction with a skimmer and pump, can process 100 to 200 liters or more of surface water, removing any oil present in a separate phase. Thus concentrated, the oil can be extracted at a laboratory, its quantity and nature determined, and when related to the volume of water processed through the sampler, provide oil concentration data on a time-integrated basis. A laboratory apparatus was designed to generate a flowing water stream containing parts per million (ppm) quantities of oil. A number of sorbent materials were examined with this apparatus and several were found effective. Effort was concentrated on the most promising one. Experiments showed that 5-25 ppm oil in a flowing water stream is quantitatively absorbed by the sorbent. The concentrated oil is easily removed from the sorbent with carbon tetrachloride used as solvent and a Soxhlet extractor. The sorbent is regenerated by this process and can be reused many times. Concentration of the extracted oil is determined by infrared spectrophotometry. (See also W76-09312) (Sinha-OEIS)
W77-00216

AN OPTIMAL PREVENTION AND DETECTION MODEL FOR POLLUTION PATROL,
Purdue Univ., Lafayette, Ind. School of Industrial Engineering.
D. G. Olson, and G. P. Wright.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 145-150, 3 fig, 2 tab, 2 ref. DOT-CG-23308-A.

Descriptors: *Oil spills, *Oil pollution, *Water pollution, *Pollution abatement, Model studies, Equipment, Monitoring, Pollutant identification.
Identifiers: *Outer Continental Shelf, Detection, Surveillance, Sensors, Hazardous materials.

A flight scheduling model is presented for sensor (infra-red and ultra-violet) equipped aircraft whose mission is the detection and prevention of harbor and coastal oil and hazardous material pollution. The objective of the model is to maximize the expected number of pollution incidents detected per pollution flight. The model requires, as an input, parameters representing probabilities of pollution incidents occurring for different geographical sectors. These parameters are estimated using, coastwise and harbor, petroleum and hazardous material shipping statistics. The shipping statistics considered include movement of petroleum products along the Atlantic, Pacific, and Gulf coasts as well as the movement of such commodities in the intra-coastal waterway system and the Great Lakes. Particular port characteristics and past pollution incident statistics are also used to estimate required parameters of the scheduling model. The constraints in the model concern the availability of aircraft, flight hours, mission hours, and the significant environmental factors which affect the performance of the sensors. (See also W76-09312) (Sinha-OEIS)
W77-00217

OIL SPILL-SOURCE CORRELATION BY GAS CHROMATOGRAPHY: AN EXPERIMENTAL EVALUATION OF SYSTEM PERFORMANCE,
Woods Hole Oceanographic Institution, Mass.
O. C. Zafiriou, J. Myers, R. Bourbonniere, and F. J. Freestone.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 153-159, 3 fig, 5 tab, 5 ref. Also as: Woods Hole Oceanographic Institution Contribution No. 2994. EPA-18050 HEC.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Pollutant identification, Gas chromatography, New York, Maine.
Identifiers: *Outer Continental Shelf, New York Bight, Performance evaluation, Detection.

A simple gas chromatographic method correlates unknown oils in natural waters with possible source oils. Under the operating procedures involved, unique matches are generally achieved without miscorrelations, even when up to 15 oils of the same type are possible sources. Oil samples are quantitatively characterized by ratios of intensities corresponding to their contents of several components of known geochemical variability and resistance to weathering. The effects of weathering, sample types, and added spill control chemicals were determined by 'blind' correlation of 35 artificially weathered oils, each with one of 17 possible sources. Oil type and weathering did not seriously influence spill-source matching success. The presence of highly similar source oils was the major performance-limiting factor. (See also W76-09312) (Sinha-OEIS)
W77-00218

TECHNIQUES FOR ANALYSIS OF PARAFFIN HYDROCARBONS AND FOR INTERPRETATION OF DATA TO ASSESS OIL SPILL EFFECTS IN AQUATIC ORGANISMS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. C. Clark, Jr, and J. S. Finley.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 161-172, 4 fig, 5 tab, 15 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Environmental effects, *Water pollution effects, Gas chromatography, Algae, Mussels, Crabs, Snails, Oysters, Aquatic animals, Aquatic environment.
Identifiers: *Outer Continental Shelf, Paraffin hydrocarbons, Crude oil petroleum, Barnacles.

Normal paraffin hydrocarbons are one of the major groups of compounds in crude oil and petroleum products. Since these compounds can be readily separated from aquatic organisms using solvent extraction and liquid-solid chromatography and identified by gas-liquid chromatography, the normal paraffins can serve as indicators of petroleum pollution in the aquatic environment. It is necessary, however, to differentiate between natural (or biogenic) hydrocarbons and those assimilated by the organisms from pollution sources by comparing the natural hydrocarbon content and pattern of organisms from areas of pollution with those of organisms from relatively 'unpolluted' areas. The paper suggests techniques for obtaining and analyzing petroleum hydrocarbon data which can lead to a standard method for detecting and following the biological uptake of oil by living organisms from the aquatic environment. (See also W76-09312) (Sinha-OEIS)
W77-00219

DETERMINATION OF N-ALKANE AND METHYLNAPHTHALENE COMPOUNDS IN SHELLFISH,
Battelle-Pacific Northwest Labs., Richland, Wash.
J. W. Blaylock, P. W. O'Keefe, J. N. Roehm, and R. E. Wildung.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 173-177, 2 fig, 2 tab, 5 ref.

Descriptors: *Shellfish, *Oil pollution, *Toxicity, Water pollution sources, Aquatic animals, *Bioassay, *Water pollution, Solvent extractions.
Identifiers: *N-alkane, *Methylnaphthalene, Hydrocarbons, Petroleum, Tissue digestion, Column separation.

During the course of investigations to determine the possible toxicity of petroleum to marine biota, it became evident that quantitative estimates of the petroleum components in water and biota would assist in meaningful interpretation of the results of bioassays. A method originally utilized for determination of polycyclic aromatic hydrocarbons in foods was adapted for the digestion of tissue and extraction of hydrocarbons from shellfish exposed to petroleum during bioassays. Tissue extracts were partitioned into saturate and aromatic fractions by column chromatography. Using gas-liquid chromatography, the n-alkanes of carbon numbers 12 to 19, and the methyl substituted naphthalenes were identified in the saturate and aromatic fractions, respectively. Both groups of compounds were quantiated by reference to an internal standard. The procedure allowed recovery of over 70% of n-alkanes and methylnaphthalenes applied to the tissues prior to digestion. Minimum detectable levels for n-alkanes and methylnaphthalenes were approximately 0.08 to 0.15 and 0.03 to 0.04 microgram/g of wet tissue, respectively. (See also W76-09312) (Sinha-OEIS)
W77-00220

IDENTIFICATION OF OIL POLLUTANTS: A REVIEW OF SOME RECENT METHODS,
National Environmental Research Center, Edison, N. J. Edison Water Quality Research Div.
M. Gruenfeld.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 179-193, 9 fig, 11 tab, 5 ref, append.

Descriptors: *Pollutant identification, *Oil spills, *Oil pollution, Water pollution, *Gas chromatography, *Spectrophotometry, *Methodology.
Identifiers: *Outer Continental Shelf, Passive tagging, Crude oils, Spectrometry.

Some recent studies of methods for identifying weathered oils through chemical fingerprints (passive tagging) are reported. These studies were performed by Esso Research and Engineering Company, Phillips Scientific Corporation, Woods Hole Oceanographic Institution, and Baird Atomic Corporation under U.S. Environmental Protection Agency (EPA) sponsored grants and contracts. A broad range of analytical instruments and techniques were used, e.g., adsorption chromatography, molecular emission and absorption spectrophotometry, atomic absorption spectrophotometry, gas chromatography, computerized mass spectrometry, et. al. Some of the oil parameters evaluated as potential fingerprint indices are vanadium, nickel, sulfur and nitrogen content, gas chromatographic profile appearance, carbon and sulfur isotope ratios, API gravity, and pour point. Several promising methods for passive tagging oils are suggested by these studies. (See also W76-09312) (Sinha-OEIS)
W77-00221

A MULTIPARAMETER OIL POLLUTION SOURCE IDENTIFICATION SYSTEM,
Phillips Petroleum Co., Bartlesville, Okla. Research Div.
J. W. Miller.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 195-203, 6 fig, 2 tab, 10 ref. EPA-No. 68-01-0059.

Descriptors: *Pollution identification, *Water pollution sources, *Oil spills, *Oil pollution, Tagging, Transportation, Laboratory tests, Organic compounds.
Identifiers: *Outer Continental Shelf, Crude oil.

The key parameters of carbon and sulfur isotopic composition, total sulfur, nitrogen, vanadium, nickel and normal paraffin odd-even carbon number predominance were measured on the 600+F residue, which simulates a weathered sample of crude oil. The variation of these parameters among 80 crude oils representative of worldwide sources of water-transported oils forms the basis of an identification system. The parameter range was carbon isotopic composition, -22 to -30 per mil; sulfur isotopic composition, -14 to +20 per mil; total sulfur 0.05 to 6.0 weight per cent; nitrogen 0.02 to 0.73 weight per cent; vanadium 0.2 to 466 wppm; nickel 0.2 to 128 wppm; and odd-even carbon number predominance 0.8 to 1.3. An unknown oil is identified by comparison of these parameters with those in a data library or from suspected sources. A computer 'look-up' system was demonstrated to match any one of the 80 crude oils with an unknown. The identification potential is strengthened by addition of the diagnostic parameters of percentage saturates, aromatics and asphaltics as measured by silica gel chromatography and the gas-liquid chromatography hydrocarbon and sulfur profiles ('fingerprints'). (See also W76-09312) (Sinha-OEIS)
W77-00222

CHARCTERISTICS OF NATURALLY OCCURRING AND POLLUTANT HYDROCARBONS IN MARINE SEDIMENTS,
Paris Univ. (France).
M. Tissier, and J. L. Oudin.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p. 205-214, 12 fig, 1 tab, 31 ref.

Descriptors: *Oil spills, *Oil pollution, *Pollutant identification, *Water pollution sources, *Toxicity, *Environmental effects, *Mud, Sediments, Aquatic animals, Ecosystems, Laboratory tests.
Identifiers: *Outer Continental Shelf, French coast, Alkyl-aromatics, Aromatic hydrocarbons.

Hydrocarbons spilled on the sea may, naturally or by sinking agent, settle on the sea bed and pollute marine muds which are the substratum of the benthic fauna and flora. They may be adsorbed by these organisms which are the basis of the nutrition for a large part of the aquatic fauna. This hydrocarbon pollutants will enter by this way in the marine food chain and raise the problem of long term toxicity. It is important to measure the quantity of hydrocarbons in the marine sediments in order to know the level of pollution. A detailed analysis of the chloroform extract of the sediment by chromatography, mass spectrometry and U.V. fluorescence can discriminate between unpolluted and polluted sediments even in the case of low level pollution. It has been noted in the unpolluted samples (collected on the French coast of the English channel in Normandie and in the Seine Bay) a higher percentage of heavy products (resins and asphaltenes), a more important odd carbon dominance in the n-alkanes distribution than in the polluted ones. The aromatic fraction of the indigenous hydrocarbons is mainly composed of polycyclic aromatic hydrocarbons without alkyl chains whereas polluted samples show many types of alkyl-aromatics. (See also W76-09312) (Sinha-OEIS)
W77-00223

COMPARATIVE IDENTIFICATION OF OIL SPILLS BY FLUORESCENCE SPECTROSCOPY FINGERPRINTING,
Environmental Protection Agency, Edison, N. J. Surveillance and Analysis Div.; and Environmental Protection Agency, Edison, N. J. Region II.
W. A. Coakley.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 215-222, 12 fig, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Pollutant identification, Gas chromatography.
Identifiers: *Outer Continental Shelf, *Fluorescence spectroscopy, Emission spectrum.

A simple and rapid method for the comparative identification of oil spills with suspect source oils is described using fluorescence spectroscopy. The method involves the excitation of an oil, diluted in cyclohexane, at a distinct wavelength and obtaining a 'fingerprint' in the form of an emission spectrum. Contamination and weathering of the environmental oil is considered. The method is applied to two different oil spills occurring near the same area at about the same time. Results are confirmed by gas chromatography. (See also W76-09312) (Sinha-OEIS)
W77-00224

DETERMINATION OF HYDROCARBON SOLUBILITY IN SEA WATER AND THE ANALYSIS OF HYDROCARBONS IN WATER-EXTRACTS,
National Bureau of Standards, Washington, D. C. Inst. for Materials Research.
S. P. Wasik, and R. L. Brown.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 223-227, 5 fig, 6 ref.

Descriptors: *Oil spills, *Oil pollution, *Pollutant identification, *Water pollution sources, *Environmental effects, Sea water, Gas chromatography, Oceans, Toxicity, Solubility.
Identifiers: *Outer Continental Shelf, Hydrocarbons analysis.

An apparatus is described for measuring the solubility of hydrocarbons in sea water and for analyzing hydrocarbons in water-extracts. The relative concentrations of the hydrocarbons in the gas phase in equilibrium with the water extract were determined by gas chromatography. A known volume of the gas phase was purged out from the apparatus and replaced with helium. The concentration of the hydrocarbons were measured after the second equilibration. The solubility of the hydrocarbon solutes in the sea water extract were determined from the peak area ratios of the solute peaks and the volume of the apparatus. Complex mixtures of hydrocarbons in aqueous solutions may be analyzed using this apparatus by examining the chromatograms obtained after each flush out. The peaks are identified as to hydrocarbon group (olefinic, aromatic, paraffinic) from the rate that the solute peak area decreased after each flush out. Overlapping peaks may be resolved using this technique. By extrapolating peak areas to zero flush out, the concentration of each solute in the original extract may be obtained. The analysis of a non-lead gasoline in sea water is presented. (See also W76-09312) (Sinha-OEIS)
W77-00225

THE TOXICITY TESTING OF OILS AND DISPERSANTS: A EUROPEAN VIEW,
Ministry of Agriculture, Fisheries and Food, London (England).
For primary bibliographic entry see Field 5G.
W77-00229

THE ISOLATION AND CHARACTERIZATION OF HYDROCARBON-UTILIZING BACTERIA FROM CHEDABUCTO BAY, NOVA SCOTIA,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
A. M. Cundell, and R. W. Traxler.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC. March 13-15, 1973. p 421-426, 5 fig, 2 tab, 18 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Water pollution, *Bacteria, Treatment, Seawater, Sediments, Littoral, *Canada, Bays, Pollutant identification.
Identifiers: *Outer Continental Shelf, Nova Scotia, Bunker oil, Fuel oil, Naphthalene, Bacterial flora, Oliphatic hydrocarbons, Aromatic hydrocarbons, Chedabucto Bay (NS).

Hydrocarbon-utilizing bacteria were isolated by enrichment culture techniques from littoral sediments and seawater collected in Chedabucto Bay, Nova Scotia, in 1972. The sample area received major Bunker C oil pollution in February 1970. Enrichment substrates were naphthalene, and Nos. 1 and 6 fuel oils incubated at 0.8 and 25C. Isolates have been obtained from samples of sediment and seawater on all enrichment substrates at temperatures of 25C and 8C. Each isolate has been shown to grow on seawater medium with No. 1 fuel oil as the substrate. The isolates were screened on n-hexane, n-dodecane, 2,2-dimethylhexane, methylcyclohexane, p-xylene, n-hexylbenzene, and naphthalene to demonstrate their profile of hydrocarbon utilization. Both aliphatic and aromatic hydrocarbon degrading bacteria were obtained from the samples. The relative rate of growth of each isolate on solid media with the various substrates has been determined at 0,8,16 and 24C. Viable cell counts in liquid culture with isolate 6-A7-25-1 were performed at 10C and 20C on naphthalene and n-hexadecane to determine generation time and lag time. (See also W76-09312) (Sinha-OEIS)
W77-00244

DEVELOPMENT OF METHODOLOGY AND APPARATUS FOR THE BIOASSAY OF OIL,
Battelle-Pacific Northwest Labs., Richland, Wash.
J. A. Lichatowich, P. W. O'Keefe, J. A. Strand, and W. L. Templeton.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference. Washington, DC, March 13-15, 1973. p 659-666, 6 fig, 3 tab, 17 ref.

Descriptors: *Bioassay, *Oil spills, *Oil pollution, *Water quality control, *Water pollution, Aquatic plants, Aquatic animals, *Methodology.

Identifiers: *Petroleum, Biological effects, Crude oil, Refined oil, Apparatus.

Techniques that may be applied in the bioassay of oil and other non-miscible materials are summarized. Bioassay procedures are described that are conducted in the flow-through tanks equipped with gravity oil metering systems and static mixers to equilibrate diluent water. Oil concentrations measured at different depths are utilized to calculate the mean level of exposure of the test organisms in the water column. Habitat preference and behavior of the test organism during bioassay were assessed in relationship to toxicity. (See also W76-09312) (Sinha-OEIS)
W77-00266

CHANGE OF THE BIOCHEMICAL COMPOSITION OF MUSSELS UNDER CONDITIONS OF REGULATED FLOW OF THE DNIEPER, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W77-00281

VERSATILE MULTIRANGE ANALYTICAL MANIFOLD FOR AUTOMATED ANALYSIS OF NITRATE-NITROGEN,
Agricultural Research Service, Watkinsville, Ga.
W. A. Jackson, C. E. Frost, and D. M. Hildreth.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 592-593, May-June 1975. 2 fig, 1 tab, 9 ref.

Descriptors: *Nitrates, *Nitrogen, Nutrients, Laboratory equipment, Laboratory tests, Soil chemistry, *Pollututant identification, Automation, Analytical techniques.
Identifiers: Technicon autoanalyzer, *Nitrate-nitrogen.

A technique is described for extending up to 100 ppm the limits of determining nitrate-nitrogen in solution using a Technicon Autoanalyzer system. The same modified analytical manifold can be used to determine three concentration ranges of nitrate nitrogen 0-1, 0-10, and 0-100 ppm. To change concentration range, change the sample entry point in the manifold and standardize the instrument within the proper range. (Skogerboe-Colo St)
W77-00285

THE IMPACT OF MAN ON THE WORLD NITROGEN CYCLE,
Purdue Univ., Lafayette. Dept. of Agricultural Economics.
B. McCarl, D. Raphael, and E. Stafford.
Journal of Environmental Management, Vol. 3, No. 1, p. 7-19, January 1975. 2 fig, 4 tab, 4 ref.

Descriptors: *Nitrogen, Atmosphere, *Model studies, Chemical reactions, *Nitrogen cycle, Environmental effects, *Air pollution effects.

The atmosphere is a complex chemical system in which nitrogen emissions, resulting from man's occupancy of the earth, mix and interact with natural nitrogen emissions. By examining the flow of nitrogen within the world, it is possible to improve the understanding of how man's emissions affect the natural nitrogen cycle. Obviously the direct effects of man's nitrogen emissions are multiplied by the natural cycle. An attempt is made to determine the multiplier effect. Through the use of input-output methodology a system with homogeneous flow may be analyzed, finding the multiplier effects. Homogeneous flow is attained in the nitrogen cycle by converting all flows into their accompanying nitrogen content. The system is then modelled and a solution derived. One ton of man's nitrogen input is then seen to produce some 800 tons of flow. (Skogerboe-Colo St)
W77-00312

THE SPECTROPHOTOMETRIC DETERMINATION OF ARSENIC IN SEA WATER, POTABLE WATER, AND EFFLUENTS,
Liverpool Univ. (England). Dept. of Oceanography.
M. G. Haywood, and J. P. Riley.
Analytica Chimica Acta, Vol. 85, No. 2, p 219-230, September, 1976. 1 fig, 6 tab, 25 ref.

Descriptors: *Water analysis, *Pollutant identification, *Arsenic compounds, *Potable water, Sea water, Effluents, *Spectrophotometry, Analytical techniques, Photometry, Copper, Nickel, Cadmium, Metals, Separation techniques, Ion exchange, Ultraviolet radiation, Oxidation, Trace elements, Water pollution sources, Water properties, Water chemistry, Heavy metals.
Identifiers: Sodium borohydride, Silver, Bismuth, Nitric acid, Sulfuric acid, *Arsenic.

Procedures are described for the determination of arsenic in sea water, potable waters, and effluents. The sample is treated with sodium borohydride added at a controlled rate. The arsine evolved is absorbed in a solution of iodine and the resultant arsenate ion is determined photometrically by a molybdenum blue method. For sea water the range, standard deviation, and detection limit are 1-4 micrograms/liter, 1.4%, and 0.14 micrograms/liter, respectively; for potable waters they are 0-800 micrograms/liter, about 1% (at 20 micrograms/liter) and 0.5 micrograms/liter, respectively. Silver and copper cause serious interference at levels of 0.5 micrograms/liter, and nickel, cadmium, and bismuth interfere at concentrations of a few tens of mg/liter; however, these elements can be removed either by preliminary extraction with a chloroform solution of dithizone or by ion-exchange. Arsenic present in organo-arsenic compounds is not directly determinable, but can be rendered reactive either by photolysis with ultraviolet radiation or by oxidation with permanganate or nitricsulfuric acid mixture. Arsenic(V) can be determined separately from total inorganic arsenic after extracting arsenic(III) as its pyrrolidine dithiocarbamate into chloroform. (Witt-IPC)
W77-00319

RE-ASSESSMENT OF CHELATING ION-EXCHANGE RESINS FOR TRACE METAL ANALYSIS OF SEA WATER,
Liverpool Univ. (England). Dept. of Oceanography.
M. I. Abdullah, O. A. El-Rayis, and J. P. Riley.
Analytica Chimica Acta, Vol. 84, No. 2, p 363-368, July 1976. 1 tab, 18 ref.

Descriptors: *Ion exchange, *Water analysis, *Heavy metals, *Trace elements, *Pollutant identification, *Sea water, Chelation, Copper, Cadmium, Lead, Zinc, Resins, Colloids, Acids, Digestion, Electrochemistry, Centrifugation, Adsorption, Separation techniques, Analytical techniques, Water pollution sources, Metals, Cations, Polarographic analysis.
Identifiers: Voltametry.

The behavior of the chelating ion-exchange resin Chelex-100 for collection of trace metals from sea water has been studied by anodic stripping voltametry after acid digestion of the sea water sample and the resin effluent. All the naturally occurring electrochemically reducible species of Cu, Pb, Cd, and Zn are chelated by the resin; this fraction of these metals is regarded as the dissolved fraction. Centrifugation showed that some of the metal liberated by acid digestion is associated with colloidal species. Neither this nor the metal adsorbed on fine particles is affected or removed by the chelating resin. (Witt-IPC)
W77-00320

THE DETERMINATION OF ZINC, CADMIUM, LEAD AND COPPER IN A SINGLE SEA-WATER SAMPLE BY DIFFERENTIAL PULSE ANODIC STRIPPING VOLTAMMETRY,
Liverpool Univ. (England). Dept. of Oceanography.
M. I. Abdullah, B. R. Berg, and R. Klimek.
Analytica Chimica Acta, Vol. 84, No. 2, p 307-317, July, 1976. 4 fig, 4 tab, 21 ref.

Descriptors: *Water analysis, *Heavy metals, *Trace elements, *Pollutant identification, *Sea water, *Zinc, *Cadmium, *Copper, Lead, Hydrogen ion concentration, Trace elements, Chemical analysis, Analytical techniques, *Electrodes, Water pollution sources, Metals, Cations, Polarographic analysis.
Identifiers: *Voltametry, Gallium.

A comparative study is described of the anodic stripping voltametry of sea water at its natural pH and at acetate-buffered pH, with a mercury film electrode. The reproducibility of the oxidation current peaks for copper and lead is improved and the electrode memory effect decreases when the sample is acetate-buffered (pH 5.8). Determinations of zinc at the natural pH of sea water are inaccurate, because of the formation of Zn-Cu and Zn-Ni intermetallic compounds in the mercury film. The formation of such compounds can be prevented by the addition of gallium ions to acetate-buffered samples. A procedure for the determination of Cu, Pb, Cd, and Zn in sea water is described. (Witt-IPC)
W77-00321

CHLORINATED HYDROCARBON PESTICIDES IN WESTERN NORTH ATLANTIC OCEAN,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W77-00325

DETERMINATION OF VINYL CHLORIDE AT MICROGRAMS/LITER LEVEL IN WATER BY GAS CHROMATOGRAPHY,
Environmental Protection Agency, Cincinnati, Ohio. Office of Research and Development.
T. A. Bellar, J. J. Lichtenberg, and J. W. Eichelberger.
Environmental Science and Technology, Vol. 10, No. 9, p 926-930, September, 1976. 14 fig, 11 ref.

Descriptors: *Water analysis, *Gas chromatography, *Pollutant identification, Analytical techniques, Trace elements, Chemical analysis, Water pollution sources, Water properties, Mass spectrometry, Silica, Gels, Organic compounds, Chemical wastes, Industrial wastes, Chlorides.
Identifiers: *Vinyl chloride, Chlorine compounds.

A quantitative method for the determination of vinyl chloride in water is presented. An inert gas is bubbled through the water sample to transfer the vinyl chloride to the gas phase. The vinyl chloride is concentrated on silica gel or Carbosieve-B under noncryogenic conditions and determined by gas chromatography with a halogen-specific detector. The method was tested over a range of 4-40 micrograms/liter. Based on earlier work with similar compounds, a useful working range of 0.1-2500 micrograms/liter should be achievable. Gas chromatography-mass spectrometry methods for providing confirmatory identification of vinyl chloride are described. (Witt-IPC)
W77-00326

STATE OF WISCONSIN AUTOMATIC WATER QUALITY MONITORING SYSTEM FOR THE FOX AND WISCONSIN RIVERS,
Wisconsin Dept. of Natural Resources, Wisconsin Rapids.
H. W. Weckwerth, P. J. Manor, and S. J. Kleinert.
In: Proceedings of the International Seminar and Exposition on Water Resources Instrumentation, June 4-6, 1974, Chicago, Illinois, Ann Arbor Science Publishers, Ann Arbor, Michigan, Vol. 1, p 452-483, 1975. 13 fig, 7 tab.

Descriptors: *Water quality, *Monitoring, *Wisconsin, *Pulp wastes, *Rivers, Data collections, Sampling, Water pollution sources, Water pollution, Pulp and paper industry, Hydroelectric plants, Dissolved oxygen, Water temperature, Hydrogen ion concentration, Electrical conductance, Turbidity, Computers, Data processing, Maintenance, Repairing, Calibrations, Organic wastes, Remote sensing, Instrumentation, Automation.
Identifiers: *Fox River(Wisc), *Wisconsin River(Wisc).

An automatic monitoring system has been operated since 1971 to provide a continuous water quality record for the Upper Wisconsin and Lower Fox Rivers which receive large amounts of organic wastes from pulp and paper mills. Continuous monitoring of the streams is necessary to document improvements in water quality expected as results of the implementation of pollution-abatement programs, and to identify locations where further efforts will be needed. The system utilizes remote monitors installed at hydroelectric plants and paper mills. It comprises 6 stations that monitor dissolved oxygen, temperature, pH, and electroconductivity on the Upper Wisconsin and 5 stations that monitor the same four variables plus turbidity on the Lower Fox. All monitors are unattended and measure each parameter by means of probes placed in the water flow. Electric signals for all parameters are sent hourly via telephone wire to a central computer in Madison which receives, records, and summarizes 1,176 water quality measurements daily. Practical considerations of system maintenance, repair, calibration, and accuracy are reviewed. (Brown-IPC)
W77-00334

COLOR REMOVAL FROM SOFTWOOD KRAFT CAUSTIC EXTRACT EFFLUENT BY POLYAMINES,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5D.
W77-00335

AUTOMATIC DETERMINATION OF WASTE WATER CHARACTERISTICS (AUTOMATISCHE BESTIMMUNG VON ABWASSERKENNGROESSEN),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
H. L. Dalpke, and L. Gottsching.
Das Papier, Vol. 30, No. 7, p 303-312, July, 1976. 5 tab, 7 ref.

Descriptors: *Waste water(Pollution), *Pulp wastes, *Water analysis, *Sampling, *Automation, Optical properties, Suspended solids, Biochemical oxygen demand, Chemical oxygen demand, Oxygen demand, Organic compounds, Carbon, Toxicity, Trace elements, Instrumentation, Effluents, Pulp and paper industry, Industrial wastes, Pollutant identification.
Identifiers: *Automated sampling.

A review is presented surveying possibilities for automated sampling of waste water as well as for automated measurement of waste water volume, optical properties, concentration of suspended materials, BOD, COD, total oxygen demand, total organic carbon, and toxicity, and determination of trace elements and organic components. In particular, five commercial systems for automated determination of COD, total oxygen demand, and/or total organic carbon are described and evaluated, particularly with respect to their suitability in analyzing pulp and paper mill effluents. (Speckhard-IPC)
W77-00338

VARIABILITY OF AMINO ACID COMPOSITION OF ALGAE INHABITING THE ZONE OF VARIABLE SALINITY, (IN RUSSIAN),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
M. F. Perlyuk, V. S. Zlobin, and T. A. Orlova.
Gidrobiol Zh 10(6), p 53-58, 1974.

Descriptors: *Amino acids, *Pollutant identification, *Algae, *Chromatography, *Salinity, Variability.
Identifiers: *Fucus-vesticulosus, Methionine, Proline, Tryptophan, Valine, Osmotic regulation, Paper chromatography.

Paper chromatography indicated 19 amino acids in quantities of 0.6-1.6% fresh weight in hydrolysates of Fucus vesiculosus grown at salinities ranging from 3-34%. Maximum amino acid concentration was found at 8.41% and minimum at 23.33%. Methionine, valine, tryptophan and proilne play the most active roles in osmotic regulation.--Copyright 1976, Biological Abstracts, Inc.
W77-00345

MICROORGANISMS AS INDICATORS OF THE ENVIRONMENTAL HYGIENE: ECOLOGY, TAXONOMY AND ENUMERATION, (IN DUTCH),
Ghent Rijksuniversiteit (Belgium). Inter-Faculty Centre for Environmental Sanitation.
W. Verstraete, and J. P. Voets.
Natuurwet Tijdschr 57(2), p 41-84, 1975.

Descriptors: *Bioindicators, *Microorganisms, *Systematics, *Ecology, Water quality standards, E coli, Coliforms, Public health, Viruses, Streptococcus, Potable water, Pollutant identification.
Identifiers: Clostridium-perfringens, Enteroviruses, Pseudomonas-aeruginosa.

A survey is presented of the different micro-organisms which can be used as indicators of environmental hygiene (fecal coli, fecal streptococci, Clostridium perfringens, enteroviruses, Pseudomonas aeruginosa; in drinking water, recreational water, swimming pools). Special attention is drawn to their ecology and taxonomic identification. Relationships between the different indicator organisms and some important hygienic criteria are discussed.--Copyright 1976, Biological Abstracts, Inc.
W77-00348

NITROGEN IN SOIL CORES AND GROUND WATER UNDER ABANDONED CATTLE FEEDLOTS,
Agricultural Research Service, Lincoln, Nebr. Animal Waste Management Research Unit.
For primary bibliographic entry see Field 5B.
W77-00365

GEOLOGIC NITROGEN IN PLEISTOCENE LOESS IN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-00366

CHEMILUMINESCENCE METHOD OF DETERMINING COPPER IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
N. A. Truba, and B. I. Nabivanets.
Gidrobiol Zh. 11(2), p 125-128, 1975.

Descriptors: *Analytical techniques, *Copper, Natural streams, Reservoirs, Chemical reactions, *Oxidation, *Pollutant identification, *Water analysis, Photometry.
Identifiers: *Luminescence, USSR, *Chemiluminescence, Kiev reservoir, Dnepr-Bug liman, Luminol.

Cu was determined by the chemiluminescence method in the Kiev Reservoir and Dnepr-Bug Liman (USSR). To establish the total Cu content in natural waters, the preliminary breakdown of organic compounds is necessary. The chemiluminescence method of analysis is based on the catalytic reaction of oxidation of luminol by cyanide complexes of Cu with the use of a chemiluminescence photometer.--Copyright 1976, Biological Abstracts, Inc.
W77-00404

MANGANESE IN FRESH WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
E. P. Nakhshina.
Gidrobiol Zh. 11(2), p 98-114, 1975.

Descriptors: *Freshwater, *Manganese, Rivers, Lakes, Reservoirs, Plankton, Bacteria, Water circulation, Flow, Diatoms, Chlorella, Reviews, Dissolved solids, Path of pollutants.
Identifiers: *Manganese complexes.

A review is given of the literature on the chemistry of Mn and Mn complexes in natural waters; quantitative characteristics of Mn dissolved in rivers, lakes and reservoirs; routes of migration; and methods of determining various forms of Mn in natural waters. (The role of Mn in the activity of diatoms, Chlorella, plankton, higher aquatic plants and bacteria is mentioned.).--Copyright 1976, Biological Abstracts, Inc.
W77-00405

HYDROGEOCHEMICAL INVESTIGATION OF THE DANUBE WATER IN AUSTRIA DURING THE YEARS 1971 AND 1972, (IN GERMAN),
Bundesversuchs- und Forschungsanstalt Arsenal, Vienna (Austria).
E. Schroll, H. Krachsberger, and P. Dolezel.
Arch Hydrobiol Supplementb. 44(4), p 492-514, 1975. (Engl. Summ.).

Descriptors: *Rivers, *Sampling, *Water levels, Analyses, Suspended solids, Chemical analysis, Spectroscopy.
Identifiers: *Austria, *Danube River, Spectrochemical analysis, Atomic absorption.

The water of the Danube was sampled at 6 points in Austria during periods of highest and lowest water levels. Suspended substances were analyzed for more than 40 elements with the aid of atomic absorption and spectrochemical and chemical methods. The results are compiled in tables. Compared with other European streams the Danube River is scarcely polluted with inorganics. Correlations between the water level and the chemical constitution of dissolved and mechanically transported substances were found.--Copyright 1976, Biological Abstracts, Inc.
W77-00406

THE IMPORTANCE OF BACTERIOLOGICAL INVESTIGATIONS FOR THE CLASSIFICATION OF FLOWING WATER BODIES DEMONSTRATED ON THE AUSTRIAN PART OF THE DANUBE, (IN GERMAN),
Bundesanstalt fuer Wasserguete, Vienna (Austria).
W. Kohl.
Arch Hydrobiol Supplementb. 44(4), p 392-461, 1975.

Descriptors: *Rivers, *Water quality, *Bacteria, *Bioindicators, Analytical techniques, Water pollution, *Pollutant identification.
Identifiers: *Austria, *Danube River.

Results of bacteriological investigations on the Danube and its tributaries demonstrate the sensitivity and selectivity of these parameters and their value as precise water quality indicators. The

efficiency of the suggested technique can be considerably increased by including other components of the limnic ecosystem and assessing their bacteriological contamination.—Copyright 1976, Biological Abstracts, Inc.
W77-00407

HYDROGEOLOGIC DATA FROM THE GREAT BEND PRAIRIE, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W77-00426

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1975.
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 7C.
W77-00435

SUITABILITY OF CONTAINERS FOR STORAGE OF WATER SAMPLES,
Australian Mineral Development Labs., Adelaide.
D. C. Bowditch, C. R. Edmond, P. J. Dunstan, and J. A. McGlynn.
Australian Water Resources Council, Canberra, Technical Paper No. 16, 1976. 39 p, 17 tab, 20 ref.

Descriptors: *Water analysis, *Water quality, *Sampling, *Laboratory tests, Chemical analysis, Plastics, Aluminum, Phosphorus compounds, Silica, Zinc.
Identifiers: *Storage containers, Glass.

Despite an increasing use of field monitoring instruments, the usual method of water quality assessment is by field sampling and subsequent analysis in the chemical laboratory. A step in this sequence is the storage of the sample in a container; any change in water quality occurring during the storage step will yield laboratory analysis which does not reflect the quality of the water as originally sampled. A study undertaken to detect interactions between containers and water samples found that most of the 25 water quality parameters (mineral analyses) tested were satisfactorily represented after storage in containers made from low or high density polyethylene or from soft glass. The exceptions were: orthophosphate was apparently adsorbed by high density polyethylene or soft glass, unless the materials were iodine-impregnated; and glass containers were unsatisfactory for silica, aluminum and zinc determinations. (CSIRO)
W77-00436

TRACE-METAL LEVELS IN THE WATERS AND SEDIMENTS OF CORIO BAY (AUSTRALIA),
Melbourne Univ., Parkville (Australia). School of Chemistry.
H. T. French, and P. J. Thistlethwaite.
Proceedings of the Royal Australian Chemical Institute, Vol 43, No. 3, p 73-79, March 1976. 5 fig, 3 tab, 18 ref.

Descriptors: *Heavy metals, Water pollution sources, *Bays, *Australia, Analytical techniques, *Cadmium, *Copper, *Lead, *Zinc, Industrial wastes, Spectroscopy, Sampling, Bottom sediments, Adsorption, Pollutant identification.
Identifiers: *Corio Bay(Vic), Geelong(Vic), Anodic stripping voltammetry, Atomic absorption spectroscopy.

Levels of copper, cadmium, lead and zinc were determined in samples of water and sediment from four sites in Corio Bay in southern Victoria, an area of potentially high metal pollution due to low water circulation and proximity to the industrial area of Geelong. A report is presented which emphasises techniques of sampling and analysis for valid results. Water samples were tested by anodic stripping voltammetry and by atomic absorption spectroscopy using both solvent extraction and ion exchange for preconcentration; sediments by conventional atomic absorption spectroscopy. The distribution of metal contents found in the water was consistent with the known sources of pollution. It was found that high surface areas of sediments were associated with high metal contents, supporting a hypothesis that removal of heavy metal from water involves adsorption onto fine particulate matter. (CSIRO)
W77-00446

STOICHIOMETRIC DISTANCE AND TOTAL CONCENTRATION: A BINARY NUMERICAL DESCRIPTION OF INLAND WATER CEHMISTRY,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2K.
W77-00449

HYDROGEOCHEMISTRY OF THE GENOA RIVER BASIN, NEW SOUTH WALES - VICTORIA (AUSTRALIA),
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Environmental Marine Geology.
For primary bibliographic entry see Field 2K.
W77-00452

TOWARDS METHOD STANDARDIZATION: E. COLI COUNTS IN WATER SAMPLES USING MEMBRANE FILTERS, (IN TURKISH),
Hacettepe Universitasi, Ankara (Turkey). Dept. of Microbiology.
M. Akman.
Mikrobiyol Bul 9(3), p 257-265, 1975.

Descriptors: *Water quality standards, *Pollutant identification, Bacteria, *E coli, Filters, *Sampling, Europe.
Identifiers: *Turkey, *Membrane filters.

The membrane filter technique in routine bacteriological examination of water samples for Escherichia coli is described. This method presently is not routinely used in Turkey.—Copyright 1976, Biological Abstracts, Inc.
W77-00453

IDENTIFICATION AND ANALYSIS OF ORGANIC POLLUTANTS IN WATER.
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
Ann Arbor Science Publishers, Ann Arbor, Michigan. 1976. 718 p. Keith, L. H. (editor).

Descriptors: *Water analysis, *Pollutant identification, *Organic compounds, *Waste water(Pollution), Wastes, Chemical wastes, Water pollution sources, Chemistry, Analytical techniques, Gas chromatography, Trace elements, Separation techniques, Mass spectrometry, Chromatography, Chemical analysis, Explosives, Polarographic analysis, Potable water, Groundwater, Lakes, Surface waters, Domestic wastes, Industrial wastes, Pulp wastes, Bleaching wastes, Organic wastes.
Identifiers: Carcinogens, Halogen compounds.

Of the 36 chapters in this compilation, 32 came from a symposium on water pollutant analysis held at the 1st Chemical Congress of the North American Continent, Mexico City, December, 1975. They are grouped under three headings: Chemistry of pollutants (foundations of organic pollutant analysis, chemistry of potential polyhalogenated water pollutants, photodecomposition of halogenated aromatic compounds, and chemical carcinogens in the environment); Techniques and methods of analysis (covering, for example, use of gas chromatographic/mass spectrometric techniques in the analysis of unusual environmental chemicals, analysis of refractory pollutants in water by high-resolution liquid chromatography, determination of organic explosives in water by single-sweep polarography); and Identification of organic pollutants (in drinking water, groundwater, lakes, and other surface waters, and in domestic and industrial effluents, including kraft pulp and paper mill and bleach plant effluents). (See W77-00456 thru W77-00459) (Brown-IPC)
W77-00455

GS/MS (GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC) ANALYSES OF ORGANIC COMPOUNDS IN TREATED KRAFT PAPER MILL WASTEWATERS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
L. H. Keith.
In: Identification and Analysis of Organic Pollutants in Water (Keith, L. H., editor), Ann Arbor Science Publishers, Ann Arbor, Michigan, p 671-707, 1976. 10 fig, 5 tab, 26 ref.

Descriptors: *Pulp wastes, *Organic compounds, *Pollutant identification, *Waste water treatment, Wastes, Industrial wastes, Gas chromatography, Mass spectrometry, Water pollution sources, Waste treatment, *Georgia, Trickling filters, Aerated lagoons, Lime, Flocculation, Oxidation ponds, Biochemical oxygen demand, Phenols, Biological treatment, Treatment facilities, Pollutants, Analytical techniques, Water pollution treatment, Organic acids, Persistence.
Identifiers: Terpenes, Resin acids, Total organic carbon, Fatty acids, Kraft mills, Board mills.

Effluents from 2 integrated kraft board mills in Georgia were sampled at various points in their waste treatment systems. Gas chromatography of the organic extracts and identification of many specific compounds by combined gas chromatography/mass spectrometry provided a chemical profile of these effluents. Raw waste water compositions of both mills were similar, but treatments differed. One mill (an unidentified linerboard producer) used trickling filters with aerated lagoons; the other (Interstate Paper Corp., Riceboro) used lime flocculation plus stabilization lagoons. Despite these differences, the treated waters showed similar qualitative compositions, although individual components (especially fatty acids) varied quantitatively. When raw and treated effluents were resampled 2 years later, concentrations of organics were different, but the same volatiles were still present. It is concluded that the volatile organic composition of kraft effluents (amounting to 1 to 10% of TOC) remains fairly constant as long as raw materials and manufacturing processes remain unchanged. Because of rapid fluctuations in the amounts of effluent organics, composite samples are needed for representative quantitative analyses. Both treatment systems achieved 85-90% reductions in BOD, 75-80% drops in volatile acids and volatile phenols, and 90% or better reductions in terpenes. Chemicobiological treatment reduced the TOC by 80-85%, total resin acids by 74% (to 6.4 mg/liter), and total phenols by 94% (to 0.2 mg/liter), compared to 60-65%, 87% (to 1.4 mg/liter), and 73% (to 0.6 mg/liter) for biological treatment alone. Treated effluents from both mills contained more fatty acids (branched and odd-numbered carbon compounds) than did the raw waste waters, probably derived from metabolites of aquatic pond organisms. (See also W77-00455) (Brown-IPC)
W77-00456

FATE OF SELECTED ORGANIC COMPOUNDS IN THE DISCHARGE OF KRAFT PAPER MILLS INTO LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington, (Ontario).
For primary bibliographic entry see Field 5B.
W77-00457

PERSISTENT ORGANIC COMPOUNDS FROM A PULP MILL IN A NEAR-SHORE FRESHWATER ENVIRONMENT,
Canada Centre for Inland Waters, Burlington, (Ontario).
For primary bibliographic entry see Field 5B.
W77-00458

IDENTIFICATION OF TWO CHLORINATED GUAIACOLS IN KRAFT BLEACHING WASTEWATERS,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
I. H. Rogers, and L. H. Keith.
In: Identification and Analysis of Organic Pollutants in Water (Keith, L. H., editor), Ann Arbor Science Publishers, Ann Arbor, Michigan, p 625-639, 1976. 4 fig, 2 tab, 16 ref.

Descriptors: *Bleaching wastes, *Phenols, *Pollutant identification, Gas chromatography, Mass spectrometry, Wastes, Industrial wastes, Water pollution sources, *Toxicity, Water pollution effects, Fishkill, Lignins, Biological treatment, Analytical techniques, Pollutants, Organic compounds, Effluents, *Canada.
Identifiers: *Guaiacols, Kraft mills, Resin acids, Chlorine compounds, Coho Salmon.

Trichloroguaiacol concentrations up to 57% of the LC(50) value and tetra-chloroguaiacol levels up to 32% of the LC(50) value were measured in kraft mill bleach plant (alkaline extraction stage) effluents. The toxicity associated with these compounds can explain at best only a fraction of the caustic effluent's overall toxicity which caused fish kill at 10% concentration. Among other compounds identified, only resin acids (present in very low concentrations) were known toxicants. Undetected compounds contributing much of the observed toxic effect may be chlorinated lignin residues with molecular weights too high for gas chromatographic analysis. A sample of whole-mill kraft effluent discharged after biological treatment in a 5-day lagoon was acutely toxic to fish at 65% concentration and contained no detectable resin acids. Gas chromatographic/mass spectrometric analyses revealed over 100 compounds, many of them chlorinated, including tri- and tetrachloroguaiacol in concentrations of 98 and 70 micrograms/liter, respectively. (See also W77-00455) (Brown-IPC)
W77-00459

NATIONAL CONFERENCE ON POLYCHLORINATED BIPHENYLS (NOVEMBER 19-21, 1975, CHICAGO, ILLINOIS), PROCEEDINGS.
Environmental Protection Agency, Washington, D. C. Office of Toxic Substances.
For primary bibliographic entry see Field 5B.
W77-00460

REVIEW OF PCB (POLYCHLORINATED BIPHENYLS) IN THE ENVIRONMENT.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5B.
W77-00463

CHLORINATED GUAIACOLS IN BLEACHERY WASTES: COMMENTS ON A PAPER BY LEACH AND THAKORE,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
I. H. Rogers.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 8, p 1858-1860, August, 1976. 1 fig, 7 ref.

Descriptors: *Pulp wastes, *Bleaching wastes, *Phenols, *Pollutant identification, *Toxicity, Pulp and paper industry, Effluents, Salmonids, Water pollution sources, Wastes, Industrial wastes, Water pollution effects, Organic compounds.
Identifiers: 3,4,5-Trichloroguaiacol, 3,4,5,6-Tetrachloroguaiacol, Chlorine compounds, Kraft mills, *Chlorinated guaiacols.

Tri- and tetrachloroguaiacol are constituents of kraft bleachery wastes which are acutely toxic to salmonids. There are four possible structural isomers of trichloroguaiacol, and no evidence was presented by Leach and Thakore to support their claim that the compounds they found had the 3,4,5-substitution pattern; cf. Journal of the Fisheries Research Board of Canada, Vol. 32, No. 8, p 1249-1257, August, 1975. (See W76-02332). Details as to how Leach and Thakore synthesized their standard chlorinated guaiacols were not presented. Identification of chlorinated resin acids and epoxides derived from unsaturated fatty acids is considered to indicate poor pulp washing efficiency, and Rogers has not observed such compounds in caustic extraction effluents from mills he has studied. (See also W77-00468) (Witt-IPC)
W77-00467

(CHLORINATED GUAIACOLS IN BLEACHERY WASTES--) RESPONSE TO THE COMMENTS OF I. H. ROGERS,
B. C. Research Ltd., Vancouver.
J. M. Leach, and A. N. Thakore.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 8, p 1860-1861, August, 1976. 3 ref.

Descriptors: *Pulp wastes, *Phenols, *Bleaching wastes, *Pollutant identification, *Toxicity, Pulp and paper industry, Effluents, Water pollution sources, Water pollution effects, Organic compounds, Wastes, Industrial wastes.
Identifiers: 3,4,5-Trichloroguaiacol, 3,4,5,6-Tetrachloroguaiacol, Chlorine compounds, Kraft mills, *Guaicols.

In a previous article the authors claim that 3,4,5-tri- and 3,4,5,6-tetrachloroguaiacol are important toxic constituents of caustic extraction effluents from kraft pulp mill bleach plants; cf. Journal of the Fisheries Research Board of Canada, Vol. 32, No. 8, p 1249-1257, August, 1975. Rogers' contention that these compounds are not present in these effluents (cf. Journal of the Fisheries Research Board of Canada, Vol. 33, No. 8, p 1858-1860, August, 1976) is rebuked by the authors. (See also W77-00467) (Witt-IPC)
W77-00468

GROUND-WATER DATA FOR ATTALA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W77-00484

GROUND-WATER QUALITY IN THE DAVIE LANDFILL, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-00486

SPECIES DIVERSITY OF FRESHWATER PLANKTON AGGLOMERATIONS, (IN POLISH),
For primary bibliographic entry see Field 7B.
W77-00495

5B. Sources Of Pollution

CAPACITY OF A SPARTINA SALT MARSH TO ASSIMILATE NITROGEN FROM SECONDARILY TREATED SEWAGE,
Georgia Univ., Sapelo Island. Marine Inst.
A. G. Chalmers, E. B. Haines, and B. F. Sherr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 640, Price codes: A05 in paper copy, A01 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC 0776, July 1976. 88 p, 21 fig, 26 tab, 54 ref. OWRT A-057-GA(1). 14-31-0001-5010.

Descriptors: *Sewage sludge, *Nitrogen, *Salt marshes, *Denitrification, *Georgia, Sludge treatment, Sludge disposal, Soil analysis, Waste assimilative capacity, Plant growth, Fertilization.
Identifiers: *Spartina alterniflora.

Air-dried, pulverized secondarily treated sewage sludge was applied to duplicate 100 m2 plots in a short Spartina high marsh near Sapelo Island, Georgia, at a rate of 200 g sludge, or 4 g nitrogen per square meter every two weeks for 12 months. Monthly measurements were made of nitrogen pools in the marsh plants and soils in the experimental plots and in duplicate control plots in the high marsh and in a low marsh area. Potential denitrification rates were also analysed for marsh soils in the study sites. Sludge fertilization of the salt marsh resulted in increased plant growth, increased content of total nitrogen in the surface marsh soils, and increased concentration of exchangeable ammonium in the top 30 cm of the soil profile. Contrary to expectation, the sludge appeared to inhibit the activity of denitrifying bacteria in the marsh soils. At the end of the study, only 50% of the sludge nitrogen applied remained on the plots, most in the surface soil. Since the natural rate of sedimentation is low in the Georgia salt marshes, the missing nitrogen was probably washed off the plots via tidal flow. There were no major differences between nitrogen pools in the control low and high marsh areas; however, the data suggested that greater mineralization rates of organic matter in low marsh soils could result in the differences in vigor and productivity between low and high marsh Spartina plants which can be ascribed to nitrogen availability.
W77-00003

BEHAVIOR OF MERCURY IN SUSPENDED SOLIDS AND BOTTOM SEDIMENTS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W77-00007

IMPACT OF LAND DISPOSAL OF SLUDGES ON GROUNDWATER,
Geraghty and Miller, Port Washington, N.Y.
G. R. Wilson.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 193-199. 5 fig, 2 tab, 16 ref.

Descriptors: *Pollutant identification, *Sludge disposal, *Land use, *Groundwater, *Water quality, Hydrologic aspects, Evaluation, Sites.

The many problems involved in evaluating the impact of land disposal of sludges on groundwater quality are discussed, with particular emphasis on the hydrologic aspects. The purpose of the discussion is to direct attention to the complexity of the subject, and to suggest some practical considerations that may be applied in evaluating potential disposal sites. The factors governing the chemical and transport behavior of contaminants through the zone of aeration and in the aquifer are enormously complex. At present there appears to be little prospect of any accurate prediction of them prior to the emplacement of sludge, or any other potential contaminant source. This situation may be rectified by theoretical and laboratory studies and by data from field investigations. It is possible to draw up guidelines for land disposal of both sludge and effluent, and this has been done by numerous agencies. These guidelines, however, cannot be definitive. Each proposed disposal site must

be studied and evaluated indivdually . (See also W77-00009) (Snyder-FIRL)
W77-00031

DYNAMICS OF THE COMPOSITION AND THE QUALITIES OF WATER-SOLUBLE ORGANIC SUBSTANCE DURING THE COMPOSTING OF CLOVER AND TIMOTHY ROOTS, (IN RUSSIAN),
Leningrad State Univ. (USSR)
V. N. Simakov, and A. V. Zhigunov.
Vestn Leningr Univ Biol. 1, p 116-121, 1975.

Descriptors: *Clovers, Chemical degradation, Chemical reactions, *Humus, Organic matter, *Water pollution sources.
Identifiers: *Composting, Organic, *Timothy roots.

The changes in the chemical composition of the substances and their molecular weight correlations indicate the different processes of humification, the stability of the substances dissolved in water and the humin-like substances generated. The humin-like substances are precipitated by acid from the fractions with molecular weight 10,000.--Copyright 1976, Biological Abstracts, Inc.
W77-00062

TRACE ORGANIC COMPONENTS AS FINGERPRINTS IN GAS CHROMATOGRAPHIC IDENTIFICATION OF SPILLED ASPHALTS,
Environmental Monitoring and Support Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W77-00085

THE RELATION OF AEROGENIC TO ANAEROGENIC AEROMONADS OF THE 'HYDROPHILA-PUNCTATA-GROUP' IN RIVER WATER DEPENDING ON THE POLLUTION LEVEL, (IN GERMAN),
Frankfurt Univ. (West Germany). Hygiene-Institut.
For primary bibliographic entry see Field 5C.
W77-00112

A PHOSPHORUS RESIDENCE TIME MODEL: THEORY AND APPLICATION,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
W. C. Sonzogni, P. C. Uttormark, and G. F. Lee.
Water Research, Vol. 10, No. 5, p 429-435, 1976. 2 fig, 1 tab, 25 ref.

Descriptors: *Phosphorus, *Lakes, *Environmental engineering, *Mathematical models, Management, Nutrients, Sedimentation rates, Equations, Systems analysis, *Water quality control, *Path of pollutants.
Identifiers: *Residence time model, *Chemical modeling, Steady state.

Chemical residence time has been used as a basis for modeling the chemical content of the ocean for some time. Recently, the chemical residence time approach has been used to model the rate of recovery of several lakes following pollution abatement. This paper relates the theoretical basis for the chemical residence time model as it applies to phosphorus and discusses the limits, capabilities and applications of the model. The model is potentially useful for assessing a variety of lake rehabilitation procedures. Effects of improved waste water treatment may be simulated by reducing the influx concentration and the impact of diversion projects can be estimated by altering both the influx concentration and the volumetric flow rate. (Bell-Cornell)
W77-00124

ROLE OF EDDY DIFFUSIVITY IN THERMOCLINE FORMATION,
Leicester Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 2H.
W77-00139

ANALYTICAL SOLUTION FOR 3-D DIFFUSION MODEL,
Envirosphere/EBASCO, New York.
E. Y. T. Kuo.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE4, Proceedings Paper 12315, p 805-820, August 1976. 8 fig, 3 ref, 3 append.

Descriptors: *Diffusion, *Open channel flow, *Dispersion, *Thermal pollution, *Dye dispersion, Hydraulics, Analytical techniques, Estuaries, Unsteady flow, Methodology, Turbulence, Equations, Mathematical studies.
Identifiers: *Constant parameter river, Absorption coefficient.

It is often desirable to estimate the ambient diffusion characteristics in a laterally bounded river and estuary, once discharge loses its momentum to its entrainment mixing processes. Although turbulent diffusions are three-dimensional in nature, the main mean convective transport and the variations of the dispersion characteristics in a river have been assumed to be longitudinal to make the problem tractable. Analytical expressions were derived for solving dye and heat diffusion in the case of their instantaneous as well as continuous release. The analytical solutions were presented for diffusion problems related to a constant parameter river. An application of the solution to a dye data analysis was described. The results indicated general agreement between the data and theoretical prediction despite the many simplifying assumptions made to obtain the analytical solution. (Singh-ISWS)
W77-00141

NUMBER, GENERATION TIME AND PRODUCTION OF BACTERIA IN WATER OF THE SARATOV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W77-00143

DISPOSITION OF FERTILIZER NITRATE APPLIED TO A SWELLING CLAY SOIL IN THE FIELD,
Texas Agricultural Experiment Station, College Station.
D. E. Kissel, S. J. Smith, and D. W. Dillow.
Journal of Environmental Quality, Vol. 5, No. 1, p 66-71, January-March 1976. 4 fig, 3 tab, 19 ref.

Descriptors: *Nitrogen compounds, *Nitrates, *Fertilizers, *Leaching, *Soil chemistry, Water quality, Analytical techniques, Leachate, Drainage, Nutrients, Runoff, Subsurface drainage, Water pollution sources, Nutrient removal, Water pollution, Percolation, Infiltration, Lysimeters, Drainage water, Grain sorghum, Root zone, Path of pollutants.
Identifiers: *Nitrate leaching, Nitrogen balance, *Nitrate fertilizer, *Nitrate-nitrogen, *Leaching losses, Nitrogen fertilizer efficiency, Nitrogen 15, Field-drainage lysimeters, Total nitrogen, Ammonium-nitrogen.

This study was prompted by the present controversy over the role that N-fertilizer use may have in reducing water quality. The objective was to determine the disposition of N fertilizer (enriched with 15N) applied to level (less than 2% slope) Houston Black clay near the economic optimum application rate (112 kg N/ha) for grain sorghum. Particular emphasis was placed on determining the amount of applied N which leached below the root zone at different times during and after the growing season. A large, undisturbed field-drainage lysimeter was used to measure leaching of NO3(-)-N below the root zone. During spring 1973, 94 mm of drainage water containing a mean concentration of 2.4 ppm fertilizer-derived NO3(-)-N percolated through the soil profile. At crop maturity, only 55% of the N applied the previous spring was recovered by the crop or was present in drainage water. Large amounts of N not recovered by the crop were either measured as immobilized N (20% of the applied N) or were unrecovered and assumed denitrified (17%). During the fall and winter, approximately 120 mm of drainage water containing 0.5 ppm or less fertilizer-derived NO3(-)-N percolated through the soil profile. These results indicated that for rainfall conditions observed in this study (minimal crop water deficit), the application of N fertilizer to grain sorghum at the near-optimum economic rate probably would not seriously reduce groundwater quality on a swelling clay soil, even though crop recovery of applied N might be low.
W77-00144

NUMERICAL ESTUARINE MODELS FOR WATER QUALITY MANAGEMENT IN THE BLACKSTONE RIVER-PROVIDENCE RIVER AND THE TAUNTON RIVER-MT. HOPE BAY COMPLEXES,
Rhode Island Univ., Kingston. Dept. of Mechanical Engineering and Applied Mechanics; and Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
F. M. White, R. C. Lessman, and M. Spaulding.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 775, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, (1976). 30 p, 15 fig, 1 tab, 7 ref. OWRT A-059-RI(1). 14-31-0001-5040.

Descriptors: Water quality, Prediction, *Model studies, *Mathematical models, Massachusetts, *Blackstone River basin(Mass-RI), Rhode Island, Management, Organic wastes, Coliforms, Distribution, Phosphates, Nitrogen, *Path of pollutants, River basins, Dissolved oxygen, Biochemical oxygen demand.

A one-dimensional numerical finite-difference model is developed for computing water quality parameters in a river basin. The model is then applied to the Blackstone River Basin between Auburn, Massachusetts and Central Falls, Rhode Island. The river is divided into 57 numerical segments of average length 4900 feet and average cross-section 500 square feet. Source loads are given for the various constituent discharges into the river. Computations are made for the distribution of dissolved oxygen, biochemical oxygen demand, total phosphates, ammonia nitrogen, nitrate nitrogen, total alkalinity, and total coliforms, for four different seasonal river volume flow rates. Good agreement is obtained for phosphate, nitrate, coliforms, and dissolved oxygen. Poorer agreement is found for ammonia, alkalinity, and BOD, the probable reason being lack of accurate source data. Some design calculations are shown for the effect of turbulent diffusion rate, decay coefficient, and improved sewage treatment on the distribution of water quality variables in the river.
W77-00152

INVESTIGATION OF BACTERIOLOGICAL POLLUTION OF RECREATIONAL WATERS IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management; and Arizona Univ., Tucson. School of Renewable Natural Resources.
G. S. Lehman, and M. M. Fogel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 779, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, August 1976. 3 p, 3 ref. OWRT A-053-ARIZ(3). 14-34-0001-6003.

Descriptors: *Water quality standards, *Arizona, *Bacteria, *Recreation, Lakes, Recreational facilities, Swimming, Water sports, *Bottom sediments, Lake sediments.

Identifiers: Recreational waters, *Bacteriological pollutions, Central Arizona, *Canyon Lake(Ariz).

Bacterial water quality was studied in a swimming area on Canyon Lake, Arizona. Water quality standards for bacteria were not exceeded early in the season, even when the facility was used at capacity. Some problems were encountered late in the season when the bacteria-laden bottom sediments were agitated by wind and wave action and/or when runoff producing storms occurred. Water currents, possibly unique to the area, provide a cleansing action that limited accumulation of undesirable quantities of bacteria in the water and sediment. Bacteria concentrations in the sediments remained at elevated levels for some time after the swimming season but decreased to the base level by the following spring.
W77-00153

AGRICULTURAL RUNOFF AS A SOURCE OF HALOMETHANES IN DRINKING WATER,
Iowa Univ., Iowa City. State Hygienic Lab.
R. L. Morris, and L. G. Johnson.
American Water Works Association Journal, Vol. 68, No. 9, p 492-494, September 1976. 4 tab, 1 ref.

Descriptors: *Agricultural runoff, *Chlorination, *Disinfection, *Iowa, *Water quality, *Organic compounds, Analytical techniques, Runoff, Agricultural watersheds, Surface runoff, Halogens, Bromine, Chlorine, Turbidity, Gas chromatography, Water treatment, Solvent extractions, Municipal water.
Identifiers: *Halomethanes, *Chlorination products, Farm runoff, Chlorine treatment, Chloroform, Carbontetrachloride, Chlorine demand, Volatile organics, Carcinogenic products, Powdered carbon, Halogenated methanes.

Data on various raw-water sources in Iowa were analyzed in relation to the finished waters produced from them; periods of high agricultural runoff were distinctly associated with peaks in halomethanes. Turbidity removal prior to chlorination was shown to be critical to minimize chloroform production during disinfection. Municipalities may be interested by the inexpensive new methodology developed to test for these substances, a current concern in the water-supply field. (Henley-ISWS)
W77-00163

SURFACE RUNOFF LOSSES OF FERTILIZER ELEMENTS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy; and Louisiana Agricultural Experiment Station, Baton Rouge.
E. P. Dunigan, R. A. Phelan, and C. L. Mondart, Jr.
Journal of Environmental Quality, Vol. 5, No. 3, p 339-342, 1976. 6 tab, 9 ref.

Descriptors: *Nitrogen compounds, *Phosphorus compounds, *Fertilizers, *Nutrient removal, *Agricultural runoff, *Louisiana, Nitrogen, Ammonia, Nitrates, Phosphates, Potassium compounds, Leaching, Potash, Runoff, Water quality, Water pollution, Analytical techniques, Surface runoff, On-site investigations.
Identifiers: Fertilizer elements, Surface runoff losses, Fertilizer nutrient losses, Nutrient transport, Nitrogen losses, Loring silt loam, Soluble nutrients, Analytical methods, Nitrogen transport, Phosphorus transport.

Surface runoff losses of fertilizer N, P, and K were measured from a Loring silt loam soil with an average slope of 5%. Plots seeded to pearl millet in 1973 an 1974 were fertilized at the rate of 112-49-93 kg/ha of incorporated N, P, and K using two different fertilizer blends, a 33.3-8.7-16.6 and an 8-3.5-6.6. The percent of water-soluble fertilizer elements lost in 1973 from the higher and lower blend concentrations, respectively, were N, 0.50 and 0.30%; P, 0.14 and 0.06% and K, 0.67 and 0.92%. In 1974, N losses were 0.89 and 0.41%; P, 0.35 and 0.20%; and K, 0.42 and 0.35%. Precipitation during the experimental periods was 20.40 cm in 1973 and 11.03 cm in 1974. Two of the millet plots were then topdressed with NH_4NO_3 fertilizer at the rate of 112 kg N/ha. Topdressed fertilizer-N losses were 2.68% in 1973 and 1.82% in 1974. Precipitation during these second tests was 27.97 cm in 1973 and 27.69 cm in 1974. Ryegrass plots were fertilized with sulfur-coated urea (SCU) and uncoated urea (U) at the rate of 224 kg N/ha during the growing seasons of 1973 and 1974. Total N losses (U vs. SCU) were 9.52 and 0.26% in 1973, and 1.67 and 0.42% in 1974. Precipitation was 23.89 cm in 1973 and 29.57 cm in 1974. A 10.08-cm rainfall on the third day of the test in 1973 caused almost three-fourths of the 9.52% N lost from the uncoated urea to be lost in that runoff and while it was still in the urea form. The sulfur coating prevented large surface losses of N from the SCU. (Henley-ISWS)
W77-00165

NITROGEN IN SUBSURFACE DISCHARGE FROM AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Columbia, Mo.
R. E. Burwell, G. E. Schuman, K. E. Saxton, and H. G. Heinemann.
Journal of Environmental Quality, Vol. 5, No. 3, p 325-329, 1976. 4 fig, 3 tab, 15 ref.

Descriptors: *Nitrogen, *Subsurface runoff, *Agricultural watersheds, *Nutrient removal, *Nitrogen compounds, *Iowa, Fertilizers, Leaching, Nutrients, Analytical techniques, Percolation, Water quality, Groundwater, Nitrates, Soil erosion, Water pollution sources, Soil conservation, Runoff, Watersheds(Basins), Conservation, Sediment discharge.
Identifiers: Nutrient transport, Nitrogen losses, *Missouri Valley, Nitrogen fertilizers, *Nutrient loss, Soluble nutrients, Chemical fertilizers, Nitrogen transport, Analytical methods.

The nitrogen in subsurface discharge and surface runoff was measured from four agricultural watersheds on Missouri Valley deep loess near Treynor, Iowa, from April 1969 through March 1974. The data showed that, with the agricultural management practices used on the watersheds, the subsurface discharge of water ranged from 62 to 88% of the average annual stream flow. Nitrate in subsurface discharge accounted for 84 to 95% of the total average annual soluble N discharged in stream flow. A terraced watershed continuously cropped to corn had reduced surface runoff, sheet-rill erosion, and associated nitrate-nitrogen discharge, but had increased subsurface discharge of water and soluble N as compared with two contoured corn watersheds. Nitrogen fertilizer applied at a high rate (448 kg/ha/year) exceeding crop needs on the terraced and contoured corn watersheds, increased five- and threefold the average annual subsurface discharge of NO_3-N, respectively, as compared with a contoured watershed fertilized with N at a normal rate (168 kg/ha/year). Controlling the watershed discharge of N and subsequent pollution of stream flow from the Iowa and Missouri deep loess hills requires N fertilizer application rates that do not exceed crop needs and using conservation practices that minimize soil erosion and deep percolation. (Henley-ISWS)
W77-00166

MATHEMATICAL MODEL FOR PREDICTING THE CONSOLIDATION OF DREDGED MATERIAL IN CONFINED DISPOSAL AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
L. D. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-020 949, Price codes: A06 in paper copy, A01 in microfiche. Technical Report D-76-1, January 1976. 110 p, 14 fig, 5 tab, 51 ref, 3 append. DMRP Work Unit 2C08.

Descriptors: *Consolidation, *Dredging, *Floods, Disposal, Flow, Spoil banks, Soil, Mathematical models, Environmental effects, Seepage, Model studies.
Identifiers: *Dredged areas, *Disposal areas, Dredged material, Dredged spoil, Dredged material disposal, Containment areas, Soil permeability, Flow patterns.

A tentative procedure was suggested for the estimation of the volume-time relationships of dredged material in a flooded containment area based on simple sedimentation and consolidation theories. The procedure also included a method to compute the consolidation of the foundation soils by standard consolidation theory. Laboratory and field investigations were necessary to verify and to develop further the equations and procedures obtained during this study for estimating volume changes with time of various types of sediments accommodated in containment areas. These factors were investigated in subsequent Dredged Material Research Program studies in order to develop a complete methodology for determining the capacity of a containment area. (Roberts-ISWS)
W77-00167

COMPOSITIONAL CHANGES OF A FUEL OIL FROM AN OIL SPILL DUE TO NATURAL EXPOSURE,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
R. N. Young, and A. J. Sethi.
Water, Air, and Soil Pollution, Vol. 5, No. 2, p. 195-205, 1975. 4 fig., 4 tab., 15 ref.

Descriptors: *Oil pollution, *Beaches, *Weathering, Sands, *Canada, Analytical techniques, Reduction(Chemical), Soils, Aromatic compounds, Ethers, Oxidation, Water pollution effects, *Oil spills.
Identifiers: *Pearce Island(British Columbia), n-Paraffins, Sulfones.

On January 24, 1973, an ocean freighter carrying heavy fuel oil struck a reef in Queen Charlotte Strait, British Columbia. The resulting oil contamination of beaches on Pearce Island was kept in its original state except for time-lapse natural weathering. Oil was extracted with petroleum ether or carbon disulfide: acetone: methanol: the solvent mixture removed 4-5 times more oil. Gas liquid chromatography and infrared absorption were used to detect compositional changes. X-ray diffraction studies showed that the soil contained quartz, feldspar (both plagioclase and alkali), plus small amounts of hornblende and kaolinite; extraction of oil enhanced the intensity and sharpness of diffraction patterns. Gas liquid chromatography indicated that low molecular weight n-paraffins were lost during weathering. Aromatics had evaporated after one day of exposure. Infrared studies indicated ethers in all samples except the original oil sample and that sulfoxides had been oxidized to sulfones, due to an oxidation reaction resulting from natural exposure. Low molecular weitht n-paraffins were lost through formation of ether and sulfone groups. After a six-month exposure to physical weather stresses up to 4% of the fuel oil spilt and washed ashore was still retained in the soil material; about 3.5% remained after a year. (Buchanan-Davidson-Wisconsin).
W77-00183

THE INFLUENCE OF HYDROLOGICAL CONDITIONS ON DISSOLVED AND SUSPENDED CONSTITUENTS IN THE MISSOURI RIVER,
Wisconsin Univ., Madison. Lab. of Hygiene.
For primary bibliographic entry see Field 5C.
W77-00184

DEPOSITION OF AIRBORNE MERCURY FROM SIX SWEDISH CHLOR-ALKALI PLANTS SURVEYED BY MOSS ANALYSIS,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W77-00186

SUBSTITUTE CHEMICAL PROGRAM: INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF MALATHION.
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5C.
W77-00192

LOS ANGELES HARBOR FIELD INVESTIGATION OF OIL AND BACKGROUND LUMINESCENCE SIGNATURES,
McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
For primary bibliographic entry see Field 5A.
W77-00197

DEVELOPING A TOTAL OIL SPILL CLEANUP CAPABILITY IN THE SAN FRANCISCO BAY AREA,
Clean Bay Inc., Concord, Calif.
For primary bibliographic entry see Field 5G.
W77-00200

COAST GUARD TRANSFER MONITORING PROGRAM,
Coast Guard, Washington, D. C. Marine Environmental Protection Div.
J. V. Leotta, and A. J. Taylor.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p. 45-51, 3 tab.

Descriptors: *Oil spills, *Oil pollution, *Monitoring, *Pollution abatement, Resources development, Water pollution, *Water quality control, Continental Shelf, Accidents, Personnel management, Washington, Coast Guard Regulations.
Identifiers: *Outer Continental Shelf, Petroleum, Puget Sound, Tankers, Loading, Fuel transfers.

Coast Guard monitoring of significant bulk petroleum transfers has a positive effect on the prevention of intentional and accidental discharges. The six month study placed Coast Guard personnel at the site of 90% of the major transfer operations occurring in the Puget Sound area. The monitors observed transfer operations to insure that all applicable regulations were being observed. Coast Guard personnel were able to develop expertise in petroleum transfer techniques and related environmental concerns involving the Coast Guard. The resulting degree of professionalism favorably affected other areas of Coast Guard involvement in water-front activities and provided a closer relationship with industry and a mutual appreciation of responsibilities. A marked decline in unknown source discharges indicated that monitoring was also effective in educating owners and operators of responsibilities in reporting discharges. The major benefit to industry was the assurance that its personnel were observing proper transfer procedures. In addition, training needs were more easily established, and the effectiveness of company training programs evaluated. Finally, employee morale improved with the realization of the importance and responsibility of their jobs. The establishment of a monitoring program nationwide is discussed. Insights gained in the Seattle effort are related to the implementation of an effective discharge prevention program with a minimal burden on industry. (See also W76-09312) (Sinha-OEIS)
W77-00204

THE VISIBILITY OF OIL-WATER DISCHARGES,
National Environmental Research Center, Edison, N. J. Edison Water Quality Research Div.
B. Hornstein.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 91-99, 2 fig, 8 tab, 8 ref.

Descriptors: *Oil spills, *Oil pollution, Water pollution, *Water quality control, *Monitoring, Discharge measurement, Films, Reflectance.
Identifiers: *Outer continental shelf, *Visibility, Detection, Oil-water mixtures, Interference color effects, Raritan Bay(NJ).

Controlled oil films from 15 through 3000 nanometers (3 microns) thick show reflectance and interference color effects that vary in an orderly way with film thickness. Visibility of a given film is variable and is affected by ambient factors that include sky conditions, water surface state, and the depth and color of the water. Controlled streams of 25 to 100 gpm, containing 5 to 250 ppm of oil, were discharged into Raritan Bay from a 65-foot vessel. Discharge points were above the surface or 2 to 5 feet below the surface, with the vessel an anchor in tidal currents, simulating a fixed source in a low current. Above-surface discharges were also made with the vessel underway at 6 to 15 knots. The visibility and appearance of films resulting from the discharges were recorded from the vessel and from a helicopter. The visibility of above-surface discharges for all combinations of water rate, oil content, and vessel speed, is correlated by a Specific Oil Rate (SOR) parameter. Results of discharges reported by the Coast Guard for vessel speeds of 10-17 kt and by the British for 8-16 kt correlate with ours via the SOR parameter. These observations were also from aircraft. Subsurface discharges appeared substantially less visible than corresponding above surface discharges. Replication, however, was insufficient to allow development of a correlation. (See also W76-09312) (Sinha-OEIS)
W77-00212

A MULTIPARAMETER OIL POLLUTION SOURCE IDENTIFICATION SYSTEM,
Phillips Petroleum Co., Bartlesville, Okla. Research Div.
For primary bibliographic entry see Field 5A.
W77-00222

CHARCTERISTICS OF NATURALLY OCCURRING AND POLLUTANT HYDROCARBONS IN MARINE SEDIMENTS,
Paris Univ. (France).
For primary bibliographic entry see Field 5A.
W77-00223

COMPARATIVE IDENTIFICATION OF OIL SPILLS BY FLUORESCENCE SPECTROSCOPY FINGERPRINTING,
Environmental Protection Agency, Edison, N. J. Surveillance and Analysis Div.; and Environmental Protection Agency, Edison, N. J. Region II.
For primary bibliographic entry see Field 5A.
W77-00224

DETERMINATION OF HYDROCARBON SOLUBILITY IN SEA WATER AND THE ANALYSIS OF HYDROCARBONS IN WATER-EXTRACTS,
National Bureau of Standards, Washington, D. C. Inst. for Materials Research.
For primary bibliographic entry see Field 5A.
W77-00225

LABORATORY AND FIELD TESTING OF SURFACE-FILM FORMING CHEMICALS FOR USE AS OIL COLLECTING AGENTS,
Naval Research Lab., Washington, D. C.
W. R. Barger.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 241-246, 3 fig, 5 tab, 9 ref.

Descriptors: *Oil spills, *Water pollution sources, *Oil pollution, *Water quality control, Testing.
Identifiers: *Outer Continental Shelf, *Oil recovery, Chemical treatment, Surface film, Collecting agents.

Forty-seven commercially available chemicals capable of controlling oil were examined in the laboratory during 1971 to determine which were practical oil collecting agents. A series of screening tests was developed, based upon physical properties and surface-chemical properties. The materials judged to be most useful by these tests are presently being evaluated in multicomponent field tests of oil recovery equipment. Both laboratory and field tests have indicated that such materials can aid in cleaning up spilled oil. (See also W76-09312) (Sinha-OEIS)
W77-00226

DEVELOPMENT OF THE 'NEXT GENERATION' CHEMICAL DISPERSANTS,
Exxon Research and Engineering Co., Florham Park, N. J.
For primary bibliographic entry see Field 5G.
W77-00227

LARGE-SCALE EXPERIMENTS ON THE SPREADING OF OIL AT SEA AND ITS DISAPPEARANCE BY NATURAL FACTORS,
Department of Trade and Industry, Stevenage, (England). Warren Spring Lab.
For primary bibliographic entry see Field 5G.
W77-00248

MEASUREMENT OF EVAPORATION RATES FROM OIL SLICKS ON THE OPEN SEA,
California Univ., Santa Barbara. Dept. of Chemical and Nuclear Engineering.
For primary bibliographic entry see Field 5G.
W77-00249

FACTORS GOVERNING THE FATE OF OIL AT SEA; VARIATIONS IN THE AMOUNTS AND TYPES OF DISSOLVED OR DISPERSED MATERIALS DURING THE WEATHERING PROCESS,
Exxon Research and Engineering Co., Linden, N.J.
J. W. Frankenfeld.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 485-495, 8 fig, 10 tab, 13 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Environmental effects, *Dispersion, *Water pollution sources, *Weathering, Organic compounds, Oxidation.
Identifiers: *Outer Continental Shelf.

An important part of the weathering process is the dissolution or dispersion of organic compounds in the aqueous phase in contact with the oil slick. Some of the factors influencing the amounts and types of compounds found in the water extracts from several crude and refined oils have been investigated. The most important influences appear to be the characteristics of the original oil and the effects of oxidation. The total soluble oil, as measured by partitioning experiments was 4-20 times that actually found after the system was opened to the atmosphere. After about a week's weathering in laboratory simulators, the dissolved organic contents ranged from 3 ppm for a light fuel oil to about 0.5 ppm for crudes and heavy fuels. The prevalent compounds in the aqueous extracts of a crude and a light fuel oil have been investigated using high resolution mass spectroscopy. These

are mostly medium molecular weight aromatics and oxygenated aromatics. The oxygenates appear to be largely alcohols and ethers possibly produced by light catalyzed oxidation during weathering. (See also W76-09312) (Sinha-OEIS)
W77-00250

EXPERIMENTAL ECOSYSTEMS TO MEASURE FATE OF OIL SPILLS DISPERSED BY SURFACE ACTIVE PRODUCTS,
Institut Francais du Petrole, Rueil-Malmaison (France).
C. R. Gatellier, J. L. Oudin, P. Fusey, J. C. Lacaze, and M. L. Priou.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 497-504, 4 fig, 3 tab, 13 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution, *Environmental effects, *Ecosystems, *Surfactants, *Biodegradation, *Toxicity, Dispersion, Sea water, Bacteria, Microbial degradation.
Identifiers: *Outer Continental Shelf, Biological effects, Dispersants, Hydrocarbons.

Efforts to measure the fate of oil dispersed by surface active products are reported. The biological degradation of petroleum, the effect of temperature, the oxygen demand, the part of the dispersant, and the necessity for nutritive elements are discussed. A description is then given of the experimental devices used in these studies. The effect of different products on the microflora of the ecosystems are tabulated. (See also W76-09312) (Sinha-OEIS)
W77-00251

DISTRIBUTION OF HEAVY HYDROCARBONS IN SOME ATLANTIC OCEAN WATERS,
Exxon Research and Engineering Co., Linden, N.J.
R. A. Brown, T. D. Searl, J. J. Elliott, B. G. Phillips, and D. E. Brandon.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 505-519, 10 fig, 6 tab, 14 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Water pollution, Atlantic Ocean, Caribbean Sea, Gulf of Mexico, Sea water, Testing, Sampling, *Path of pollutants.
Identifiers: *Outer Continental Shelf, Hydrocarbons, U.S. East Coast, U.S. Gulf Coast.

During 1971-72 ocean water samples were collected off tankers along two well traveled routes, including: U.S. Gulf Coast to East Coast and Caribbean to East Coast. Approximately 400 samples were taken near the surface and at a depth of about 10 meters. At the time of collection, each sample was extracted with carbon tetrachloride. The extract was subsequently analyzed for hydrocarbon content and, in many cases, the hydrocarbons were characterized as to compound types. Nonvolatile or persistent hydrocarbons were found to be generally in the concentration range of .001 to .012 ppm (wt.). Some variations in the amount and composition were observed according to geographical location of the sample. Sampling and analysis methods are briefly described. The data presented here show that the hydrocarbons in the sea derived from whatever source are extremely low. The data further suggest that the hydrocarbons were derived at least in part from petroleum. There are variations in the amount and composition of the hydrocarbons within the sea water system, and more detailed study may well define the sources and ultimate fate of hydrocarbons in the sea. (See also W76-09312) (Sinha-OEIS)
W77-00252

PREDICTION OF OIL SLICK MOTIONS IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Dept. of Mechanical Engineering and Applied Mechanics.
J. Premack, and G. A. Brown.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 531-540, 11 fig, 3 tab, 11 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Pollution abatement, *Water pollution, Estuaries, Planning, Rhode Island, *Path of pollutants.
Identifiers: *Outer Continental Shelf, Narragansett Bay(RI), Prediction.

A comparison of the calculated size and arrival times for the P.W. Thirtle oil spill with existing data indicate that the oil spill motion simulation can assist the oil contigency planner significantly in estimating the size and arrival times of an oil spill in a tidal estuary. The assumption that a 24,000 barrel spill can be simulated by the independent spreading and drifting of 12 hourly spills, each of 2,000 barrels, is at best a crude one. However, based on the evidence of this particular study it appears to be accurate enough for contingency planning purposes. However, additional analytical work should be done to permit a more physically correct modeling of the process. (See also W76-09312) (Sinha-OEIS)
W77-00253

THE PHYSICAL OCEANOGRAPHY AND WATER QUALITY OF NEW YORK HARBOR AND WESTERN LONG ISLAND SOUND,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5G.
W77-00273

RETENTION OF ARSENIC BY HYDROXY-ALUMINUM ON SURFACES OF MICACEOUS MINERAL COLLOIDS,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
P. M. Huang.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 271-274. March-April 1975. 2 fig, 5 tab, 19 ref.

Descriptors: *Soil chemistry, *Arsenic compounds, Soil properties, Soil investigations, Soil chemical properties, Colloids, Ions, Geochemistry.
Identifiers: *Arsenic, Biotite, Musconite, Miceovs mineral colloids.

This study was carried out to examine the relative significance of as retention by hydroxy-Al on external and interlamellar surfaces of micaceous mineral colloids. Depletion of K from muscovite and biotite decreased as retention. This effect was attributed to the exclusion of arsenate ions by the K-depleted layers. Hydroxy-Al in the interlamellar spaces of vermiculite and K-depleted micas was not found to contribute significantly to as retention in the solution concentration range of 2 to 10 ppm as. (Skogerboe-Colo St)
W77-00283

VARIATIONS IN THE NATURAL ABUNDANCE OF N OF WHEAT PLANTS IN RELATION TO FERTILIZER NITROGEN APPLICATIONS,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 3F.
W77-00292

EFFECT OF ANION EXCLUSION ON THE MOVEMENT OF CHLORIDE THROUGH SOILS,
Chile Univ., Santiago. Facultad de Ciencias Quimicas.
H. Appelt, K. Holtzclaw, and P. F. Pratt.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 264-267, March-April 1975. 2 fig, 4 tab, 14 ref.

Descriptors: *Soil chemistry, *Chlorides, *Soil chemical properties, Soil investigations, Soil properties, *California, *Cation exchange, Geochemistry.
Identifiers: *Anion exclusion, Chloride movement.

The effects of anion exclusion on the movement of chloride through soils were studied using a variety of subsurface soil samples from southern California. The data reported suggest that the nature of the clay mineral, clay content, saturation percentage and iron oxide content together with the cation-exchange capacity are important sol characteristics related to the volume of exclusion. General equations that are based only on specific charge seem to be oversimplifications. Another serious limitation of general equations obtained under laboratory conditions is their extrapolation to field conditions. The high variability regarding salt distribution commonly found in the field makes the use of correction factors, such as volume of exclusion, of limited value. More studies under field conditions are necessary before quantitative predictions can be made using general equations obtained with disturbed soil samples in the laboratory. (Skogerboe-Colo St)
W77-00293

DENITRIFICATION RATES IN RELATION TO TOTAL AND EXTRACTABLE SOIL CARBON,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 2G.
W77-00294

SORPTION OF SULFUR DIOXIDE BY CALCAREOUS SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
M. S. Yee, H. L. Bohn, and S. Miyamoto.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 268-270. March-April 1975. 5 fig, 3 tab, 14 ref.

Descriptors: *Sorption, *Sulfur, *Sulfur compounds, *Calcareous soils, Soil chemistry, Soil chemical properties, Pollutants, Soil moisture.
Identifiers: *Sulfur dioxide.

The capacities and rates of calcareous soils to sorb SO2 were measured by a steadystate method in which a stream of air plus SO2 passed rapidly through the soil. At room temperature, air-dry calcareous soils were saturated with SO2 within 10 to 15 min from a dry gas stream. The sorption capacities, 0.4 to 1.6 g of S/100 g of soil at 0.34% SO2 in air, increased with SO2 concentration and specific surface of the soils. Moisture in the air and/or soil increased the SO2 sorption capacities to 0.8 to 6 g of S/100 g, approximately equivalent to the acid titratable basicities, but saturation required several hours. The initial sorption rate ranged from 0.06 to 0.29% S/min in the moist soils. (Skogerboe-Colo St)
W77-00295

RELATIONSHIPS BETWEEN SORPTION AND DESORPTION OF PHOSPHORUS BY SOILS,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
J. C. Ballaux, and D. E. Peaslee.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 275-278, March-April 1975. 1 fig, 7 tab, 22 ref.

Descriptors: *Sorption, *Phosphorus, *Soil properties, Soil investigations, Soil chemistry, Soils, *Kentucky.
Identifiers: *Desorption.

Relationships between the sorption and desorption of P were investigated for five soils ranging in clay content from 16 to 51%. Langmuir adsorption isotherms for some soils were curvilinear when the P concentration in the equilibrium solution was >10 micro-g/ml. To evaluate sorption at higher concentrations of P, values of adsorption maxima (b) and indices of bonding energy (k) were estimated from tangents to six segments of each isotherm. Within each soil, the six pairs of b and k values were related according to the equation k=(a/b)(n), where n was a unique characteristic for each soil. (Skogerboe-Colo St)
W77-00298

INTERACTION BETWEEN AQUATIC PLANTS AND BED SEDIMENTS IN MERCURY UPTAKE FROM FLOWING WATER,
National Research Council of Canada, Ottawa (Ontario). Div. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-00301

EFFECT OF ALTERNATE AEROBIC AND ANAEROBIC CONDITIONS ON REDOX POTENTIAL, ORGANIC MATTER DECOMPOSITION AND NITROGEN LOSS IN A FLOODED SOIL,
Louisiana State Univ., Baton Rouge. Lab. of Flooded Soils and Sediments.
K. R. Reddy, and W. H. Patrick, Jr.
Soil Biology and Biochemistry Vol. 7, No. 2, p 87-94, March 1975. 6 fig, 1 tab, 25 ref.

Descriptors: *Aerobic conditions, *Anaerobic conditions, Organic matter, *Decomposing organic matter, Nitrogen, Nitrates, Denitrification, *Oxidation reduction potential, Flooding, Saturated soils.
Identifiers: *Nitrogen loss(Soils).

The effect of several cycles of varying length of alternate aerobic and anaerobic conditions on redox potential, organic matter decomposition and loss of added and native nitrogen was investigated under laboratory conditions in flooded soil incubated for 128 days. Redox potential decreased rapidly when air was replaced with argon for the short-time cycles, but decreased more slowly where the aerobic period was long enough to permit build-up of nitrate. The minimum redox potential reached during the anaerobic period was generally lower for the longer cycles, but in all cases was low enough for denitrification to occur. Rate of decomposition of organic matter was faster in the treatments with a greater number of alternate aerobic and anaerobic periods. (Skogerboe-Colo SU)
W77-00306

RELATIONSHIPS BETWEEN THE DENITRIFICATION CAPACITIES OF SOILS AND TOTAL, WATER-SOLUBLE AND READILY DECOMPOSABLE SOIL ORGANIC MATTER,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-00311

A SYSTEMATIC PROCEDURE FOR TAXING AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-00314

CHLORINATED HYDROCARBON PESTICIDES IN WESTERN NORTH ATLANTIC OCEAN,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
R. B. Jonas, and F. K. Pfaender.
Environmental Science and Technology, Vol. 10, No. 8, p 770-773, August, 1976. 2 fig, 1 tab, 12 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Atlantic Ocean, *Water pollution, Waste dilution, *DDE, *Dieldrin, Aldrin, DDD, DDT, Pesticides, Water pollution sources, Oceans, Halogenated pesticides, Organic pesticides, *Distribution patterns, Insecticides, Pollutants, *Path of pollutants.
Identifiers: *Lindane(Gamma-hexachlorocyclohexane).

Both 1,1-bis-(p-chlorophenyl)-2,2-dichloroethylene (DDE) and dieldrin (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo-exo-5,8-dimethano-naphthalene) were detected in the offshore waters of the western North Atlantic Ocean from the surface to 1000 m depth. The mean concentrations of the two pesticides are 3.8 (DDE) and 5.8 (dieldrin) parts per trillion (ng/liter). Other chlorinated pesticides, including lindane, aldrin, 1,1-bis-(p-chlorophenyl)-2,2-dichloroethane (DDD), and DDT, could not be detected at most sample sites by currently available analytical techniques. The data suggest that considerable variability, both with depth and distance from shore, is a dominant feature of the distribution of chlorinated pesticides in the North Atlantic Ocean. Concentrations of DDE and dieldrin range from 0.1 to 18.1 and 0.4 and 19.4 ng/liter, respectively. The observed environmental distribution of these pesticides would be consistent with a hypothesis of uptake and transport of these compounds on particulates in the sea. (Witt-IPC)
W77-00325

KLEBSIELLA DENSITIES IN WATERS RECEIVING WOOD PULP EFFLUENTS,
Environmental Protection Agency, Dauphine Island, Ala. Gulf Coast Water Supply Research Lab.
For primary bibliographic entry see Field 5C.
W77-00337

ON THE EUTROPHICATION IN THE LAKE CHANGJA, (IN KOREAN),
Seoul National Univ. (Republic of Korea). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-00344

THE EFFECT OF SURFACE-ACTIVE SUBSTANCES ON PATHOGENIC ENTEROBACTERIA IN WATER, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (II) (USSR).
For primary bibliographic entry see Field 5C.
W77-00346

THE BEHAVIOR OF PSEUDOMONAS AERUGINOSA IN SURFACE WATER, COOLING WATER AND WASTE WATER, (IN GERMAN),
Bonn Univ. (West Germany). Hygiene Institut.
K. Botzenhart, R. Wolf, and E. Thofern.
Zentral Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med 161(1), p 72-83, 1975.

Descriptors: *Cooling water, Water pollution, Thermal pollution, Sewage, Biological treatment, Pseudomonas, *Aerobic bacteria, Microorganisms.
Identifiers: *Pseudomonas-aeruginosa.

The occurrence and numerical behavior of P. aeruginosa in natural waters with and without waste water contamination, in dams, cooling water circulation systems and cooling water discharge, in clarification plant and supplementary laboratory tests are reported. P. aeruginosa may occur in the natural flora of open waters, but only following the introduction of human sewage. A rapid reduction of the number of P. aeruginosa to low levels generally occurs over periods of several days to several weeks. In the presence of large quantities of nutrient, multiplication of P. aeruginosa in natural waters is possible. It appears in technical systems such as cooling water circuits and filter plants. P. aeruginosa probably also multiples in waste water; in the biological aerobic clarification process a reduction occurs. The effect of higher temperature on the survival or multiplication of P. aeruginosa was not confirmed by laboratory experiments.--Copyright 1975, Biological Abstracts, Inc.
W77-00347

SEABED DRIFTER MOVEMENT IN SAN DIEGO BAY AND ADJACENT WATERS,
Naval Undersea Center, San Diego, Calif.
R. R. Hammond.
Available from the National Technical Information Service, Springfield, VA, 22161, as AD-A022 604, Price codes: A04 in paper copy, A01 in microfiche. Report NUC TP 507, February 1976. 55 p, 9 fig, 8 tab, 34 ref, 2 append.

Descriptors: *Water circulation, *Path of pollutants, *Estuaries, *Harbors, *California, Tides, Circulation, Bays, Sediment transport, Currents(Water), On-site investigations, Coasts, Shores, Pollution, Water pollution control, Pollution abatement.
Identifiers: *San Diego Bay(Calif), Bottom water movement, Seabed drifters, Tidal flushing, Drifters.

Of vital importance in achieving effective control of pollution in estuaries near dense population centers is a detailed knowledge of the water circulation and flushing mechanisms. Although several experimental and hydrodynamic-numeric studies have been made of the San Diego estuarine system, no information existed on net bottom water movement which affects the flushing of solid waste and sediment transport. Since the seabed drifter has been used successfully to provide valuable information in many estuarine and open sea environments, it was selected for use in the San Diego area. Five hundred drifters were released in the bay and adjacent ocean waters to delineate bottom flow patterns. Four significant bottom drift regimes were discussed: off coastal, main bay channel, open bay, and semi-enclosed docking basins. Mean residual bottom drift ranged from 0.17 kilometers per day off the coast to essentially zero in the docking basins. This compared favorably with results of similar studies of other California estuarine systems. Contrary to expectations, off coast drifter results (31% recovery) showed a persistent north moving bottom current with shallow near coast drift distances between 4 and 25 kilometers. In the open bay a reverse trend was observed from the 16% of the drifters recovered. At the head of the estuary, evaporative densification was believed to occur, with the heavier water sinking and moving outward toward the estuary mouth, resulting in an area of opposing bottom water currents. (Sims-ISWS)
W77-00356

COLIFORM BACTERIA FROM DIFFUSE SOURCES AS A FACTOR IN ESTUARINE POLLUTION,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
M. A. Faust.
Water Research, Vol. 10, No. 7, p 619-627, 1976. 3 fig, 5 tab, 35 ref.

Descriptors: Coliforms, *Bacteria, *Water pollution sources, *Estuarine environment, *E. Coli, *Chesapeake Bay, Sewage bacteria, Water quality, Estuaries, Pollutants, Runoff, Agricultural runoff, Surface runoff, Watersheds(Basins), Nitrates, Phosphorus, Microorganisms, Livestock, *Maryland.
Identifiers: *Coliform bacteria, *Estuarine pollution, *Fecal coliform, *Diffuse pollution sources, *Estuarine ecosystems, *Rhode River(Md), Bacterial pollution, Bacterial analyses, Total

phosphorus, Rural watershed, Coliform discharge, Fecal pollution.

The contribution of 849 ha of rural watershed to the fecal coliform (FC) pollution of the Rhode River, a subestuary of Chesapeake Bay with a surface area of 485 ha, was estimated. The watershed with an animal population of 0.6 animal unit/ha discharged between 7,500,000 and 669,000,000 FC/ha-day. The FC discharge rate was seasonal and largely dependent upon the water flow. Total coliform (TC) discharge was influenced by the same factors as the FC discharge. It was calculated that, on the average, less than 1% of FC produced by the animals on the land was washed down by water runoff. Occasionally the FC discharge rate in the runoff reached 4-6% of the FC produced by the animals. Fecal coliforms persisted in the water. The FC numbers were high in the Rhode River close to the discharge points, and further away the FC numbers were diluted by the river volume. It was estimated, using the maximum number of FC in the runoff, that 2600 cu m of well mixed receiving water was needed for every ha of watershed area not to exceed the safe water standards (14 FC MPN/100 ml) for shellfish harvesting. Three factors having a role in FC pollution of an estuarine ecosystem were emphasized as a result of this study: (1) the rural watershed contributed substantial quantities of FC to the estuary; (2) the season of the year may determine the level of pollution entering from rural sources into the estuary; (3) the persistence of bacteria in the estuary may increase the pollution level contributed by the watershed, especially at low water temperatures. (Henley-ISWS)
W77-00359

VERTICAL DIFFUSION DRIVEN BY INTERNAL WAVES IN A SILL FJORD,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 2L.
W77-00360

NITROGEN IN SOIL CORES AND GROUND WATER UNDER ABANDONED CATTLE FEEDLOTS,
Agricultural Research Service, Lincoln, Nebr. Animal Waste Management Research Unit.
L. N. Mielke, and J. R. Ellis.
Journal of Environmental Quality, Vol. 5, No. 1, p 71-75, January-March 1976. 5 fig, 2 tab, 17 ref.

Descriptors: *Nitrates, *Nitrogen, *Feed lots, *Soil contamination, Water pollution sources, *Groundwater, Soils, Crops Farm management, Soil chemistry, Cores, Pollutants, Pollutant identification, Agriculture, Farm wastes, Cattle, Livestock, Confinement pens, Wastes.
Identifiers: *Abandoned feed lots.

Soil core samples from four abandoned beef cattle feedlots were analyzed to determine their chemical and physical characteristics. These cores were compared with those from active upland, intermittantly used feedlots, and croplands. The nitrate-nitrogen (NO3-N) in the abandoned feedlots averaged 7,200 kg/ha in a 9.1-m soil core, while the active upland, intermittently used feedlot, and cropland averaged 1,800, 2,100, and 570 kg/ha NO3-N, respectively. The abandoned feedlot core with the highest NO3-N had 18,200 kg/ha in a 9.1-m core. Nitrate-N levels in an abandoned feedlot after 15 years of corn-alfalfa rotation were comparable with cropland cores. Groundwater samples obtained from three of the four abandoned feedlots contained 77.2, 43.7, and 0.6 ppm NO3-N. (Sims-ISWS)
W77-00365

GEOLOGIC NITROGEN IN PLEI)CENE LOESS IN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Agronomy.
J. S. Boyce, J. Muir, A. P. Edwards, E. C. Seim, and R. A. Olson.
Journal of Environmental Quality, Vol. 5, No. 1, p 93-96, January-March 1976. 3 fig, 1 tab, 15 ref.

Descriptors: *Nitrogen, *Nitrates, *Soil contamination, *Nebraska, *Soils, *Loess, Fertilization, Fertilizers, Agricultural chemicals, Water pollution, Leaching, Irrigation, Cores, Soil chemical properties, Geology, Limestones, Shales, Groundwater.

Research into the relationship between fertilizer use and water quality in Nebraska has resulted in the discovery of large quantities of geologic nitrate within the deep loess mantle of southwestern and central Nebraska. The N03(-) was first encountered at a depth of about 7 m and continued to an unknown depth in excess of 30 m. Nitrate-N values of 25 to 45 ppm characterized the N zone, but values to 87 ppm have been recorded. The N03(-) existed only under the more level uplands of the region; however, it is on this plain that rapid development of irrigation is taking place, and it has been shown that the N03(-) has been leached from beneath older irrigation sites on the plain. (Sims-ISWS)
W77-00366

SIMILARITY OF THE MEAN MOTION OF FLUID PARTICLES DISPERSING IN A NATURAL CHANNEL,
Geological Survey of Canada, Ottawa(Ontario).
T. J. Day, and I. R. Wood.
Water Resources Research, Vol. 12, No. 4, p 655-666, August 1976. 13 fig, 3 tab, 22 ref.

Descriptors: *Dispersion, *Flow, *Turbulence, *Channel morphology, *Hydrologic data, Velocity, Methodology, Tracers, Distribution patterns, Statistical methods.
Identifiers: Self-similar process, Concentration-time diagram, Dispersing cloud, Channel geometry.

The longitudinal dispersion in natural river channels was shown to exhibit the characteristics, constant velocity ratios, and similarity in the distribution of physical dimensions of a self-similar process. Although the kinematic relations and the structure of the turbulent field were sensitive to the nature of the flow boundaries and the geometry of the channel, similarity was maintained in flows in a wide range of steep gravel and boulder bed channels. A simple method was developed for predicting the longitudinal pattern of dispersion. It contained three basic hydraulic parameters which could be determined by a field experiment. Data on steep channels and distances up to 1000 channel widths from the dump point were used in developing the method. Though these data were rather limited in scope, the results suggested that the general method may be applicable to streams with a range of characteristics. (Singh-ISWS)
W77-00371

MEASUREMENTS OF ESTUARY DISPERSION COEFFICIENTS,
Rhodesia Univ., Salisbury. Dept. of Civil Engineering.
P. R. B. Ward.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE4, Technical Note, p 855-860, August 1976. 1 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Dispersion, *Rhodamine, *Estuaries, *Saline water intrusion, *Tidal effects, On-site tests, Dye dispersion, Velocity, Equations, Travel time, Sampling, *Path of pollutants, *Canada.
Identifiers: *British Columbia, *Fraser estuary(BC), Tidal flow.

Measurements of the dispersion of dye clouds from point sources were made in the Fraser estuary located in British Columbia. This estuary is typical of several large estuaries in that area, and it i characterized by conditions of large tidal rang and large freshwater discharge. A salt water wedg penetrates the estuary for several miles durin flood tidal flows, provided the freshwate discharge is not close to its maximum. On-site ex periments were conducted to ascertain the disper sion characteristics of dye clouds for the followin conditions: (1) small river discharge and large tid flow seawards, and (2) medium river discharge an small tidal flow seawards. The values of th dimensionless transverse dispersion coefficient determined from these experiments were withi the range of values measured in laboratory exper ments for tidal flows in meandering channels. Th transverse mixing was not nearly completed in th duration of the experiment, and the dispersion c the dye cloud was not affected by zones of lo velocity near the edges of the channel. (Singh ISWS)
W77-00381

SODIUM CARBONATE IN GROUND WATER OF THE TURKMEN SSR, (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W77-00384

GEOGRAPHICAL AND SEASONAL VARIA BILITY OF MARINE PLANKTON.
Akademiya Nauk SSSR, Leningra Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W77-00393

ZOOPLANKTON OF DIKSON BAY (KAR SEA),
Akademiya Nauk SSSR, Leningra Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W77-00395

MANGANESE IN FRESH WATERS, (IN RU SIAN),
Akademiya Nauk URSR, Kiev. Instyt Hidrobiologii.
For primary bibliographic entry see Field 5A.
W77-00405

HYDROGEOCHEMICAL INVESTIGATION O THE DANUBE WATER IN AUSTRIA DURIN THE YEARS 1971 AND 1972, (IN GERMAN),
Bundesversuchs- und Forschungsanstalt Arsen Vienna (Austria).
For primary bibliographic entry see Field 5A.
W77-00406

THE IMPORTANCE OF BACTERIOLOGICA INVESTIGATIONS FOR THE CLASSIFIC TION OF FLOWING WATER BODIE DEMONSTRATED ON THE AUSTRIAN PAR OF THE DANUBE, (IN GERMAN),
Bundesanstalt fuer Wasserguete, Vien (Austria).
For primary bibliographic entry see Field 5A.
W77-00407

EVENTS IN THE DJERDAP RESERVOIR I MEDIATELY AFTER IMPOUNDMENT, (GERMAN),
Institute for Biological Research, Belgra (Yugoslavia).
For primary bibliographic entry see Field 2H.
W77-00409

INTRODUCTION TO THE KNOWLEDGE O FRESHWATER INVERTEBRATES AND THE ENVIRONMENT, (IN DUTCH),
Rijksinstituut voor Natuurbeheer, Leers (Netherlands).
For primary bibliographic entry see Field 2I.
W77-00410

TRANSPORT OF CARBON14-ASSIMILATES IN THE SUGAR BEET UNDER DIFFERENT CONDITIONS OF NUTRITION AND MOISTURE, (IN RUSSIAN),
Kirgiz State Univ., Frunze (USSR).
V. A. Pechenov.
Fiziol Biokhim Kul't Rast. 7(3), p 286-290, 1975.

Descriptors: *Sugar beets, *Productivity, *Soil moisture, *Nutrient requirements, Nitrogen, Potassium, Phosphorus, Path of pollutants, Radioactivity.
Identifiers: *Carbon-14.

Total radioactivity of all organs in sugar beet which were given N, P and K was sometimes as high as that in the plants which were not given the minerals. The outflow rate of assimilates increased with the age of plants and particularly in the period intensive accumulation of sugar. Optimization of soil moisture conditions favored a considerable intensification of the assimilate transport into the storage organs. Conditions of mineral nutrition and soil moisture changed the direction of labeled C incorporation into different fractions of organic substances. With rational treatment and optimization of the water regime, the outflow of assimilates into the root crop intensified, the percentage of 14C incorporation into sugars increased and the yield of sugar per unit of the sowing area increased.--Copyright 1976, Biological Abstracts, Inc.
W77-00421

TRACE-METAL LEVELS IN THE WATERS AND SEDIMENTS OF CORIO BAY (AUSTRALIA),
Melbourne Univ., Parkville (Australia). School of Chemistry.
For primary bibliographic entry see Field 5A.
W77-00446

HYGIENIC ASPECTS OF MICROBIAL CONTAMINATION OF WATER BASINS, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
T. A. Nikolaeva, G. A. Bagdasar'Yan, A. I. Itskova, and Y. G. Talaeva.
Vestn Akad Med Nauk SSR 3, p 46-52, 1975.

Descriptors: *Microbial degradation, Recreation, *Self-purification, Basins, *Bacteria, *Viruses, Water pollution, Public health, *Human diseases.

Increasing microbial contamination of water basins, its causes and its role in spreading bacterial and viral intestinal diseases are discussed. The significance of microbial contamination in direct short or long term recreational contact of the population with water of basins is shown; development of recreation institutions for long-term rest near water basins is discussed. Self-cleaning of water basins (microbial, chemical and thermal pollution, correlation between health-important microflora, pathogenic enterbacteria and viruses) is elucidated. The barrier role of existing waterpipe systems with respect to chemical pollutants and pathogenic microflora is discussed. Tasks facing hygienists under conditions of increasing microbial contamination of water basins are stated.--Copyright 1976, Biological Abstracts, Inc.
W77-00454

IDENTIFICATION AND ANALYSIS OF ORGANIC POLLUTANTS IN WATER.
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-00455

FATE OF SELECTED ORGANIC COMPOUNDS IN THE DISCHARGE OF KRAFT PAPER MILLS INTO LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington, (Ontario).
M. E. Fox.
In: Identification and Analysis of Organic Pollutants in Water (Keith, L. H., editor), Ann Arbor Science Publishers, Ann Arbor, Michigan, p 641-659, 1976. 7 fig, 9 tab, 7 ref.

Descriptors: *Pulp wastes, *Lake Superior, *Organic compounds, Wastes, Industrial wastes, Water pollution sources, Biota, Fish, Water pollution effects, Pollutants, Water pollution, Lake sediments, Waste dilution, Sediments, Persistence, *Path of pollutants, *Canada.
Identifiers: Nipigon Bay, Nipigon Strait, Kraft mills, Dehydroabietic acid, Resin acids.

Of the 35 identified organic compounds which are dispersed by the effluent plume of a kraft bleached pulp mill into Nipigon Bay, only dehydroabietic acid persisted in the water column. Whether the detected concentrations could cause sublethal effects in lake biota, such as fish tainting, is unknown. Dissipation of organics by dilution with receiving waters appears to be the principal short-term mechanism. Surface sediments contained elevated dehydroabietic acid levels, clearly originating from the discharge. The movement of this material follows the deep channel toward Nipigon Strait and was measured at almost 10 times the Bay's background level at a distance of 15 km from the effluent discharge. (See also W77-00455) (Brown-IPC)
W77-00457

PERSISTENT ORGANIC COMPOUNDS FROM A PULP MILL IN A NEAR-SHORE FRESHWATER ENVIRONMENT,
Canada Centre for Inland Waters, Burlington, (Ontario).
B. Brownlee, and W. M. J. Strachan.
In: Identification and Analysis of Organic Pollutants in Water (Keith, L. H., editor), Ann Arbor Science Publishers, Ann Arbor, Michigan, p 661-670, 1976. 1 fig, 3 tab, 6 ref.

Descriptors: *Pulp wastes, *Organic compounds, *Lake Superior, Wastes, Waste dilution, Industrial wastes, Water pollution sources, Great Lakes, Lake Sediments, Organic wastes, Water pllution, freshwater, Discharge(Water), Effluents, Organic acids, Persistence, Sediments, *Path of pollutants, *Canada.
Identifiers: Nipigon Bay, Dehydroabietic acid, 7-keto-dehydroabietic acid, Palmitic acid, Dioctyl phthalate, Acetovanillone, Sandaracopimaric acid, Kraft mills, Resin acids, Fatty acids.

A 25 sq km section of Nipigon Bay on the North shore of Lake Superior was sampled for organic compounds which could have entered the receiving waters from a kraft mill discharge site. Tentative conclusions reached from the findings are as follows: The effluent is a significant source of dehydroabietic acid, some of which enters the bay in particulate form; this acid is quite persistent in the water column, being found in surface sediments in significant amounts 1 km from the plume outfall. Likewise persistent were palmitic acid and dioctyl phthalate. Moderately or slightly persistent were acetovanillone, sandaracopimaric acid, and 7-keto-dehydroabietic acid. (See also W77-00455) (Brown-IPC)
W77-00458

NATIONAL CONFERENCE ON POLYCHLORINATED BIPHENYLS (NOVEMBER 19-21, 1975, CHICAGO, ILLINOIS), PROCEEDINGS.
Environmental Protection Agency, Washington, D. C. Office of Toxic Substances.
Rept. No. EPA-560/6-75-004, 471 p, March, 1976.

Descriptors: *Polychlorinated biphenyls, *Conferences, *Water pollution sources, *Toxicity, Analysis, Ecology, Economics, Control, Pathology, Biology, Pollutants, Industrial wastes, Wastes, *Pollutant identification, Water pollution control, Aromatic compounds, Organic compounds, Chemical wastes, *Toxicity.

The conference was organized into 8 sessions, including a summary session of the other 7, which dealt with various aspects (pathobiology, toxicology, sources, identification, analysis, ecology, economics, chemical substitutes, and control) of polychlorinated biphenyls, as well as with the viewpoints of various interested parties (government, industry, and private citizens). (See W77-00461 thru W77-00462) (Brown-IPC)
W77-00460

THE VIEW OF THE PAPER INDUSTRY ON THE OCCURRENCE OF PCB'S IN THE ENVIRONMENT AND THE NEED FOR REGULATION,
Container Corp. of America, Carol Stream, Ill.
P. E. Trout.
In: National Conference on Polychlorinated Biphenyls, November 19-21, 1975, Chicago, Illinois, U.S. Environmental Protection Agency, Office of Toxic Substances (Washington, D.C. 20460), Report No. EPA-560/6-75-004, p 359-361, March 1976. 3 ref.

Descriptors: *Pulp and paper industry, *Polychlorinated biphenyls, *Aroclors, *Water pollution sources, *Legislation, Environment, Pollutants, Wastes, Industrial wastes, Chemical wastes, Organic compounds, Aromatic compounds, Chemicals, Regulation, Toxicity, Persistence, Costs.

On behalf of the American Paper Institute and the Container Corporation of America, the author put forth and justified the following 4 statements: The paper industry does not use or introduce polychlorinated biphenyls (PCB's) into the environment but rather recirculates those already present which are unavoidably included in its manufacturing output. The PCB recirculated by the paper industry (Aroclor 1242) is not found to accumulate in animals, man, or the environment. Current levels of dietary intake are many orders of magnitude lower than the daily intake allowable according to the Food and Drug Administration. Any additional regulatory controls should aim at maximum environmental cost effectiveness. (See also W77-00460) (Brown-IPC)
W77-00461

STATEMENT RELATING TO POLYCHLORINATED BIPHENYLS ON BEHALF OF THE WISCONSIN PAPER COUNCIL,
Bergstrom Paper Co., Neenah, Wis.
J. S. Haney.
In: National Conference on Polychlorinated Biphenyls, November 19-21, 1975, Chicago, Illinois, U.S. Environmental Protection Agency, Office of Toxic Substances, (Washington, D.C. 20460), Report No. EPA-560/6-75-004, p 362-364, March 1976.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Pulp and paper industry, *Legislation, Biodegradation, Pollutants, Wastes, Industrial wastes, Water pollution sources, Recycling, Organic compounds, Aromatic compounds, Chemical wastes, Toxicity, Persistence, Wisconsin.
Identifiers: *Wisconsin Paper Council, Carbonless paper(No-carbon copying paper), Waste paper, Copying paper.

Only a small fraction of domestically produced polychlorinated biphenyls (PCB's) has been used in making carbonless copying paper. The Aroclors involved are less stable, less persistent, less susceptible to accumulation in fish, and more biodegradable than their more highly chlorinated

relatives. The impact of the waste paper recycling industry on the PCB issue should be put into a more positive perspective. PCB's cannot be legislated out of paper-recycling systems. Proposed regulations should be realistic, reasonable, feasible, and responsible. (See also W77-00460) (Brown-IPC)
W77-00462

REVIEW OF PCB (POLYCHLORINATED BIPHENYLS) IN THE ENVIRONMENT.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
Report No. EPA-560/7-76-001, 141 p, January 1976.

Descriptors: *Public health, *Polychlorinated biphenyls, *Water pollution sources, *Environment, Lakes, Rivers, Pollutants, Industrial wastes, Cities, Foods, Human population, Monitoring, Pollutant identification, Surveys, Inspection, United States, Data collections.

The data presented have been compiled from national and local monitoring programs and show trends of PCB levels in lake, river, and marine environments, industrial plants, cities, foods, and humans. (Brown-IPC)
W77-00463

THE EFFECT OF SOIL PROPERTIES ON ZINC ADSORPTION BY SOILS,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-00469

INTERACTIONS BETWEEN ORGANIC COMPOUNDS, MINERALS, AND IONS IN VOLCANIC ASH DERIVED SOILS: I. ADSORPTION OF BENZOATE, P-OH BENZOATE, SALICYLATE, AND PHTHALATE IONS,
California Univ., Riverside. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-00473

INTERACTIONS BETWEEN ORGANIC COMPOUNDS, MINERALS, AND IONS IN VOLCANIC-ASH-DERIVED SOILS: II. EFFECTS OF ORGANIC COMPOUNDS ON THE ADSORPTION OF PHOSPHATE,
California Univ., Riverside. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-00474

EFFECT OF AGRICULTURAL DRAINAGE ON WATER QUALITY,
Virginia Polytechnic Inst. and State Univ., Blackstone. Southern Piedmont Center.
M. D. Smolen, M. Rasnake, and V. O. Shanholtz.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, 9 pages, December 15-18, 1975. Chicago, Illinois. 5 fig, 4 ref. OWRT A-058-VA(1).

Descriptors: *Return flow, *Drainage, Water quality, Water pollution control, Model studies, Water chemistry, Nitrogen, Nitrates, Irrigation effects, *Path of pollutants, Monitoring.
Identifiers: Nitrate-nitrogen.

Presentation of preliminary results from a modeling and monitoring study which compares chemical quality data from adjacent agricultural and non-agricultural areas. Increased levels of nitrate-nitrogen were detected in field draining streams following the first period of agricultural activity. Results are discussed in terms of a planned comprehensive chemical transport study. (Skogerboe-Colo St)
W77-00475

VARIATIONS IN PICLORAM LEACHING PATTERNS FOR SEVERAL SOILS,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 2G.
W77-00476

NITRATE REDUCTION AND NITRITE UTILIZATION BY NITRIFIERS IN AN UNSATURATED HANFORD SANDY LOAM,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
M. G. Volz, L. W. Belser, M. S. Ardakani, and A. D. McLaren.
Journal of Environmental Quality, Vol. 4, No. 2, p 179-182, April-June 1975. 2 fig, 2 tab, 20 ref.

Descriptors: *Nitrates, *Nitrites, *Soil investigations, *Nitrification, Soil environment, Soil management, Agriculture, Soils, Loam, Microbiology, California, Soil analysis, Path of pollutants, Water pollution control.
Identifiers: *Microbial ecology.

In order to discern any relationship between added nitrate and microbial growth in a field plot, a Hanford sandy loam was infiltrated for 5 weeks at a rate of 5 cm/day with a solution containing 100 ppm-N and 1.25 meg/liter C1(-) KNO(3) and CaC1(2) respectively. Nitrate -N, NO(2)(-)-N and C1(-) concentrations in soils solution were determined and corresponding counts of nitrate reducers, denitrifiers, and NH(4)(+)- and NO(2)(-)-oxidizer populations were made. Ratios of measured to applied concentrations for both NO(3)(-)-N and C1(-) were nearly identical in all solution samples taken from the unsaturated soil profile, i.e., nitrate reduction was not pronounced and NO(2)(-)-N was less than 1 ppm. (Skogerboe-Colorado State)
W77-00478

GROUND-WATER QUALITY IN THE DAVIE LANDFILL, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
H. C. Mattraw, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 522, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-56, June 1976. 29 p, 7 fig, 11 tab, 4 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Groundwater movement, *Waste disposal, Septic tanks, Sewage lagoons, Landfills, Oil, Incineration, Water quality, Chemical analysis, Bacteria, Nitrogen, Sodium, Aquifers, *Florida, Pollutant identification, Coliforms.
Identifiers: *Broward County(Fla).

Ground-water adjacent to a disposal pond for septic tank sludge, oil, and grease at the Davie landfill, Broward County, Florida was tested for a variety of ground-water contaminants. Three wells adjacent to the disposal pond yielded water rich in nutrients, organic carbon and many other chemical constituents. Total coliform bacteria ranged from less than 100 to 660 colonies per 100 milliliters in samples collected from the shallowest well (depth 20 feet). At well depths of 35 and 45 feet bacterial counts were less than 20 colonies per 100 milliliters or zero. Concentrations of several constituents in water samples collected from the wells downgradient from the landfill, disposal pond, and an incinerator wash pond were greater than in samples collected from wells immediately upgradient of the landfill. A comparison of sodium-chloride ion ratios indicated that downgradient ground-water contamination was related to the incinerator wash water pond rather than the septic tank sludge pond. (Woodard-USGS)
W77-00486

MODELING OF THE TRANSFORMATION OF NITROGEN COMPOUNDS IN A CLOSED AQUATIC CHEMICAL-ECOLOGICAL MICROSYSTEM, (IN RUSSIAN),
A. V. Leonov, and T. A. Aizatullin.
Ekologiya. 6(2), p 5-10, 1975.

Descriptors: *Mathematical models, *Ecosystems, Aquatic environment, *Nitrogen compounds, Chemical degradation, Lakes, Waste water treatment, Ecological distribution, *Path of pollutants, Organic compounds.
Identifiers: *Heterotrophs, *Chemoautotrophs.

A mathematical model of a closed chemical-ecological microsystem responsible for transformation of N compounds in an aquatic environment is presented. The model reflects the dynamics of heterotrophs, chemoautotrophs, N-containing compounds, NH3, NO2, NO3 and 02. The model satisfactoriy describes experimental data on the dynamics of the system's components in lake and wastewaters. It can serve as the basis for a model of a real ecological macrosystem.—Copyright 1976, Biological Abstracts, Inc.
W77-00494

DISTRIBUTION OF BENTHONIC FORAMINIFERS OFF THE WESTERN COAST OF SOUTH AMERICA, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 2L.
W77-00496

5C. Effects Of Pollution

ENVIRONMENTAL IMPACT OF CADMIUM AND OTHER HEAVY METALS FROM LAND-APPLIED SEWAGE SLUDGE,
Wisconsin Univ., Madison. Dept. of Soil Science.
D. R. Keeney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 643, Price codes: A03 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC-76-03, July, 1976. 31 p, 11 tab, 29 ref. OWRT A-065-WIS(1). 14-31-0001-5050, 14-34-0001-6052.

Descriptors: Metals, *Public health, *Toxicity, *Sludge disposal, *Municipal wastes, *Soil contamination, Chemical properties, *Wisconsin, *Heavy metals, *Cadmium, Environmental effects, Sewage sludge, Soil profiles.
Identifiers: *Casco(Wis), *Monroe(Wis), *Beloit(Wis), *Chippewa Falls(Wis), Janesville(Wis).

Median Cd concentration in fertilizers (primarily P-containing materials) was about the same as in wastewater sludges in Wisconsin. The estimated Cd addition to soils from fertilizers was 2,150 kg, while sludges could add about 1,700 kg Cd if all sludges were land-applied. However, due to differences in the rate of application of these Cd sources, sludge disposal on land could result in a much higher Cd concentration in the soil. A survey of 5 municipalities where sludge has been applied to soil showed that, in general, little metal accumulation in the soil or crops resulted from sludge application. However, metal concentrations of the sludges from the municipalities were generally low compared to sludge from municipalities with heavy industry. High metal accumulations in the turf in a park and golf course were found in areas where sludge had been applied recently. High metal concentrations were also noted in the soil profile in an area where dewatered sludge had been stockpiled for 2 years. Intensive sampling was conducted at one site where records on the rate of sludge addition for 5 consecutive years were available. Results indicate significant increases above background in DTPA-extractable metals but little leaching of the metals, even though the soil was sandy. Statistical analysis of the sample variability showed that the results were

iite variable and that a large number of replicate eld samples are needed to obtain valid results.
'77-00002

APACITY OF A SPARTINA SALT MARSH TO SSIMILATE NITROGEN FROM SECONDARI-Y TREATED SEWAGE,
eorgia Univ., Sapelo Island. Marine Inst.
or primary bibliographic entry see Field 5B.
'77-00003

HE EFFECTS OF VARIOUS TERTIARY REATMENT NUTRIENT REMOVAL CHEMES ON PERIPHYTON COMMUNITIES N MODEL LABORATORY STREAMS,
irginia Polytechnic Inst. and State Univ., lacksburg. Dept. of Biology.
C. Smrchek, P. H. King, J. Cairns, Jr., K. L. ickson, and C. W. Randall.
vailable from the National Technical Informa-on Service, Springfield, VA 22161 as PB-259 010, rice codes: A07 in paper copy, A01 in microfiche. irginia Water Resources Research Center, lacksburg, Bulletin 86, (VPI-VWRRC-BULL 5), July 1976. 124 p, 18 fig, 54 tab, 180 ref, ap-end. OWRT B-039-VA(2).

escriptors: *Eutrophication, *Periphyton, Tertiary treatment, *Nutrient removal, Water ollution effects, Algae, Pigments, Biomass, Pri-ary productivity, *Phosphorus, Algal control, Vaste water treatment.
dentifiers: Model stream systems.

. model stream system was established to study ie effects upon periphyton communities of ef-luents from conventional or up-to-date tertiary eatment processes for nutrient(s) removal. Algal hytopigments, dry weight biomass, organic eight biomass, pigment diversity ratios, and pri-ary productivity of these communities were stu-ied during six different experiments. Laboratory cale treatment systems for ferric chloride coagu-tion, flocculation and dual media filtration rocesses were used in the phosphorus removal xperiment and in the carbon and phosphorus ex-eriment. Breakpoint chlorination was used in the trogen removal experiment. A combination of all ie above processes was used in the carbon, itrogen, and phosphorus removal experiment. ymptoms of enrichment and cultural eutrophica-on, as indicated by substantial increases in the ove biological parameters, were noted during ie six experiments. In most cases, the differences these values between control and experimental odel streams were statistically significant. Single utrient removal caused greater increases in these arameters than double or triple removal methods. utrient limitation probably did not occur in any the experiments because of nutrients in the ter-ary effluents. Also, nutrient uptake by the eriphyton of phosphate, nitrate nitrogen, and am-onia nitrogen occurred. Phosphorus fixation and ilization by the periphyton was noted. Based on ese results, phosphorus was probably not defi-ent in the model streams during any of the ex-eriments. Eutrophication problems similar to ose noted in the present study may occur in atural streams and rivers near discharges from rtiary treatment plant facilities. However, pro-ded the receiving aquatic ecosystem is suffi-ently 'healthy' or ecologically diverse, grazing ream herbivores may effectively limit the in-ease in algal biomass.
'77-00005

ITROGEN EXCRETION BY NITROGEN FIX-IG BLUE-GREEN ALGAE: III. UTILIZATION F THE EXCRETED NITROGEN BY GREEN LGAE, (IN GERMAN),
iel Univ. (West Germany). Institut fuer Phar-akognosie.
Pohl, and G. Drath.
Naturforsch Sect C Biosci. 30(2), p 223-226, 75.

Descriptors: *Chlorophyta, Nitrogen fixation, *Cyanophyta, *Algae, Anabaena, Absorption, *Nutrients, *Nitrogen.
Identifiers: Anabaena-cylindrica, Anabaena-solitaria, Chlorella-vulgaris, Chlorhormidium-spp, Scenedesmus-obliquus, Ulothrix-subtilissima, Uronema-barlowi, *Nitrogen fixing alga(Blue-green).

The total combined N (850 micro-mol N/l) excreted by the N fixing blue-green alga, Anabaena cylindrica, during growth in an artificial nutrient medium, was subsequently utilized to a different degree by various green algae (Chlorella vulgaris, Scenedesmus obliquus, Ulothrix subtilissima, Uronema barlowi, Chlorhormidium spp.). Two species of filamentous green algae, Chlorhormidium sp. (strain I) and Chlorhormidium sp. (strain II), proved to be most suitable. When grown in the above N-enriched medium after removal of A. cylindrica, they lowered the N level in the medium from 850 to 460-600 micro-mol N/l within 29 days. When another N fixing blue-green alga, A. solitaria, was grown under unsterile conditions in mixtures of freshwater and seawater with trace elements (Fe, Mn and Mo) added, N levels of 1000-1060 micro-mol N/l were obtained. These levels were subsequently lowered to 530-570 micro-mol N/l by the 2 spp. of Chlorhormidium. Under appropriate growth conditions, the combined N excreted by A. solitaria can possibly be utilized as a N source for green algae.–Copyright 1975, Biological Abstracts, Inc.
W77-00006

BEHAVIOR OF MERCURY IN SUSPENDED SOLIDS AND BOTTOM SEDIMENTS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
W. P. Bonner, and R. B. Bustamante.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 663, Price codes: A06 in paper copy, A01 in microfiche. Research Report No. 50, July 26, 1976. 118 p, 36 fig, 14 tab, 74 ref. OWRT A-027-TENN(1). 14-31-0001-5043.

Descriptors: *Mercury, Water pollution, Sediments, Heavy metals, *Suspended solids, Pollution control, Toxicity, *Bottom sediments, Aquatic environment, Absorption, Organic matter, Food chains, Path of pollutants.
Identifiers: *Mercury compounds, Mercuric chloride, Mercuric sulfide, Metallic mercury, Phenyl mercuric acetate, Selenium.

Laboratory studies were conducted to show several relationships between selected components of an aquatic environment containing mercury. The data show that mercury as mercuric chloride, mercuric sulfide, phenyl mercuric acetate and metallic mercury becomes associated with sediments very rapidly and with time natural mechanisms in the sediments tend to stabilize or bind the mercury and make it less available to the aquatic environment. Organic components of the water-sediment system play an important role in binding mercuric mercury. Experimental fish show an increase in both the rate of uptake and elimination with increasing temperature between 9 and 30C. Inorganic forms of selenium and mercury are antagonistic toward the toxicity of each other. Collectively, temperature and the presence of naturally occurring organic materials and antagonistic agents could significantly reduce the possibility of mercury accumulation in a food chain leading to man.
W77-00007

PLANT UPTAKE OF HEAVY METALS FROM SEWAGE SLUDGE APPLIED TO LAND,
Department of Agriculture, Beltsville, Md.
For primary bibliographic entry see Field 5D.
W77-00028

EFFECTS OF SEWAGE SLUDGE OR EFFLUENT APPLICATION TO SOIL ON THE MOVEMENT OF NITROGEN, PHOSPHORUS, SOLUBLE SALTS AND TRACE ELEMENTS TO GROUNDWATERS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
A. L. Page, and P. F. Pratt.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 179-187. 1 fig, 38 ref.

Descriptors: *Pollutant identification, *Sewage sludge, *Effluents, *Land use, *Soil water movement, Soil types, Nitrogen, Phosphorus, Salts, Trace elements, Groundwater.

The movement of nitrogen, soluble salts, phosphorus, and trace elements through soils is discussed in terms of the chemistry of these individual constituents and in relation to low and high rate applications of sludges and effluents and soil properties. When considering the movement of these substances through soils, it is important to distinguish between low rates consistent with utilization fro crop production and high rates that might be used for disposal of sludges and effluents or for groundwater recharge using reclaimed waters. At low rates of 3 to 5 tons dry solids per acre per yr to supply the phosphorus needs of crops or 10 to 25 dry tons per acre per yr to supply their nitrogen needs, downward movement of phosphorus and most trace elements is nil or very slow. Soluble salts and nitrate move with drainage waters. At rates of 3 to 5 surface feet of effluent waters per year to supply water needs for irrigated lands, phosphorus and trace elements added will not move downward to any great extent in most soils. Inert sands and gravels of low organic matter contents have low adsorptive capacities and allow rapid transmission of water.Water also generally moves more slowly in soils of higher clay content. Soils other than sands have a high capacity to retain arsenic, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, selenium, and zinc. Where sludge of effluents are added to agricultural soils to supplement plant nutrients or as a source of irrigation water, essentially all of these trace elements applied should remain within the surface meter of soil. In groundwater recharge or disposal involving high application rates, movement of trace elements will depend on the amount and composition of the waters applied and the nature of the soil or sediment. (See also W77-00009) (Snyder-FIRL)
W77-00029

ENVIRONMENTAL EFFECTS OF SLUDGE DISPOSAL IN SANITARY LANDFILLS,
Environmental Protection Agency, Washington, D. C.
B. R. Weddle.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 188-192. 1 fig, 3 tab, 1 ref.

Descriptors: *Pollutant identification, *Environmental effects, *Sludge disposal, *Landfills, *Land use, Sewage sludge, Public health, Soil contamination.
Identifiers: Land application.

The land disposal of sewage sludge involves growing controversy. Advocates of spreading sludge on farmland face increased opposition on the grounds that sufficient information does not exist on the human health implications from long-term low-level injection of crops grown on sludge amended soil. This lack of information about survival and movement of pathogens in groundwater and soils is being used to 'kill' proposed projects for sludge disposal and utilization. The portion of the problem of ultimate sludge disposal dealing with environmental effects of subsurface disposal of municipal waste water sludges is discussed. The

principal conclusions of an investigation of the environmental and economic effects of disposing liquid sludge and septic tank pumpings into a sanitary landfill are included. It was concluded that the solid wastes generated by a city should have adequate capacity to absorb all the water in its liquid digested sludge. A second study was undertaken to evaluate the environmental impact of mixed sludge/solid waste and 'sludge only' disposal sites. Nine sites were selected, including a range of operational practices, geographical, and climatological conditions. Wells were drilled to sample leachate and gas at the sites. The first data was not available in time to be included. (See also W77-00009) (Snyder-FIRL)
W77-00030

POTENTIAL HEALTH IMPACTS OF SLUDGE DISPOSAL ON THE LAND,
Environmental Protection Agency, Research Triangle Park, N.C.
G. J. Love, E. Tompkins, and W. A. Galke.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 204-213. 1 tab, 136 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Public health, *Sludge disposal, Land use, Irrigation effects, Waste water(Pollution), Sludge, Agriculture, Pathogenic bacteria, Viruses, Chemicals.

The potential for adverse human health effects associated with waste water treatment and disposal systems is related to many pathogens and other pollutants with multiple pathways to man. A wide variety of pathogenic bacteria, viruses, and parasites occur in sewage. Effluent and sludges both contain significant numbers of pathogens after primary treatment, but ozonation, pasteurization, gamma radiation, and chlorination can be used to kill pathogens. Pathogens can travel over fairly large distances in aerosols from sewage or sludge spraying, but seldom travel very far in soil. Possible routes of infection include groundwater contamination, aerosols, direct contact with contaminated environments, transmission by wild animals coming into contact with sewage or sludge, and infection of crops. The infectivity of virus appears high, and some routes of infection can involve the production of large numbers of bacterial cells. Little is known about the possible health effects from chronic ingestion of small quantities of organic and inorganic compounds and heavy metals. Obviously a potential for adversely affecting human health is associated with applying waste waters or sludge to agricultural lands. The degree of risk relates to soil types on which the materials are applied, the treatment of the wastes, and care exercised by individuals involved in treatment or land application. The greatest hazard would probably result from disrupting good treatment or sanitary practices. The use of waste waters and sludges to fertilize and irrigate crops in many areas suggests, despite associated disease outbreaks, that the practice can function safely. The limited quantities of essential chemicals and water available to produce food makes it necessary to find a safe use for waste water and sludge. (See also W77-00009) (Snyder-FIRL)
W77-00033

FDA'S OVERVIEW OF THE POTENTIAL HEALTH HAZARDS ASSOCIATED WITH THE LAND APPLICATION OF MUNICIPAL WASTEWATER SLUDGES,
Food and Drug Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W77-00034

BIOASSAY PROCEDURES FOR THE OCEAN DISPOSAL PERMIT PROGRAM,
Environmental Protection Agency, Gulf Breeze, Fla. Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-00041

BEFORE REMOVING NUTRIENTS...RE-ANALYZE LAKE TAHOE,
Utah Water Research Lab., Logan.
D. B. Porcella, and P. H. McGauhey.
Water and Wastes Engineering, Vol. 13, No. 2, p 17-19, 23, 44, February, 1976. 1 fig, 2 tab.

Descriptors: *Reclaimed water, *Algae, *Nutrients, *Reservoirs, *Plant growth, Reclamation, Phosphorus, -Nitrogen, Phytoplankton, Phytotoxicity, Organic compounds, Irrigation, *Nutrient removal.
Identifiers: Lake Tahoe, Indian Creek Reservoir.

The use of tertiary effluent as irrigation water for the Indian Creek Reservoir is discussed in relation to the effect of nutrient addition on algal blooms. Observations made at the reservoir after its filling revealed a water quality which is conducive to aquatic weed development but not to phytoplankton blooms. Influent nutrient levels indicated that substantial plant productivity should be observed, and the aquatic weed growth confirmed this to be the case. Factors which may have a role in controlling the presence and quantity of blue green algae in Indian Creek Reservoir include: the presence of excess inorganic nitrogen relative to low phosphorus concentrations, low levels of trace elements which may be limiting to blue greens and other algal groups, the low phosphorus levels in reservoir waters, low concentrations of biostimulatory organic compounds which are probably removed by activated carbon treatment, and the possible toxicity of high nitrogen levels to specific algae. (Kreager-FIRL)
W77-00045

CAUSES AND ALTERNATIVE SOLUTIONS TO THE WATER QUALITY PROBLEMS OF BIG STONE LAKE, WESTERN MINNESOTA-NORTHEASTERN SOUTH DAKOTA,
Midwest Research Inst., Kansas City, Mo.
A. R. Hylton, R. Flippin, A. Aleti, J. R. Ward, and J. Rasmussen.
Journal of Environmental Sciences, p 27-32, May/June, 1976. 5 fig, 1 tab, 11 ref.

Descriptors: *Water pollution effects, *Eutrophication, *Lakes, *Algae, Minnesota, South Dakota, Phosphates, Nitrates, Turbidity, Silts, Nutrients, Fish, Reservoirs, Economics, Dredging, Pollution abatement.
Identifiers: *Big Stone Lake(Minn-SD).

Eutrophication problems associated with Big Stone Lake, a natural lake which lies in the valley of a former glacial river at the western Minnesota-northeastern South Dakota border, are discussed along with some alternatives for eliminating the problem. There are three general types of algae common to the lake: filamentous algae, free floating planktonic algae, and planktonic blue-green algae. The most obvious water quality changes which have occurred in the lake in recent years are an enrichment in phosphates and nitrates and increased siltation and turbidity. The adverse effects of man's influence on the lake's environment may be partially corrected by the following measures: reducing nutrient inflow from feedlots, selective dredging, periodic removal of rough fish, the use of upstream reservoirs, and acceptable land treatment measures. An analysis of the comparative economics of the above control measures is also presented. (Kreager-FIRL)
W77-00047

CLOSED LOOP HIERARCHICAL CONTROL FOR RIVER POLLUTION,
Saint John's Coll., Cambridge (England).
For primary bibliographic entry see Field 5G.
W77-00051

IS NUTRIENT REMOVAL WORTHWHILE,
Iowa State Univ., Ames. Dept. of Animal Ecolo
For primary bibliographic entry see Field 5D.
W77-00065

THE RELATION OF AEROGENIC ANAEROGENIC AEROMONADS OF T 'HYDROPHILA-PUNCTATA-GROUP' IN RIV WATER DEPENDING ON THE POLLUTI LEVEL, (IN GERMAN),
Frankfurt Univ. (West Germany). Hygiene-stitut.
R. H. W. Schubert.
Zentralbl Bakteriol Parasitenkd Infektionskr H Erste Abt Orig Reihe B Hyg Praev Med. 160(3 237-245, 1975.

Descriptors: *Aerobic bacteria, *Anaerobic b teria, *Microorganisms, *Water pollution sourc Rivers, Wastes.
Identifiers: *Aeromonads, Aeromonas-hyd phila, Aeromonas-hydrophila-anaeroger Aeromonas-punctata, Aeromonas-puncta caviae, Saprobic systems, *Aerogenic spec *Anaerogenic species.

Analysis of the relationship between the aeroge and anaerogenic Aeromonas spp. of the hyd phila-punctata group in moving waters with v ing waste loads showed that in the sewage w the anaerogenic subspecies A. hydrop anaerogenes and A. punctata caviae predomi over the aerogenic species A. hydrophila and punctata with an average of 78%. Polysapr rivers and brooks show a similar relation. aerogenic aeromonads (mainly A. hydroph dominate over the anaerogenic aeromonads oligosaprobic brooks with a low range of variat of the individual value of 90% on the average. alpha- and beta-mesosaprobic rivers show (wi great variation of the values indicated at each place) a relation of aerogenic to anaeroge aeromonads of 39:61 for the alpha-mesosaprob and 43:57 for the beta-mesosaprobics on average; they are close to each other in an aver analysis. The great differences in the indivi value of both groups indicate that the determi tion of the relation of the aerogenic to anaeroge aeromonads could show a more sensitive sys of waste contamination or waste load than saprobic system. Since the anaerogenic subspe A. anaerogenes and A. p. caviae are ecologic similar and A. hydrophila of the aerogenic spe is the widely predominating microorganism, de mination of the relation of aerogenic anaerogenic aeromonads of the hydrophila-pu tata group is sufficient.—Copyright 1976, Biol cal Abstracts, Inc.
W77-00112

ENVIRONMENTAL EFFECTS OF ALTER TIVE ENERGY DEVELOPMENTS IN T NORTHERN GREAT PLAINS,
United Nations, New York.
For primary bibliographic entry see Field 6G.
W77-00115

VOLATILE FATTY ACIDS IN BOTT DEPOSITS OF THE RYBINSK RESERVOIR, RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biol Vnutrennykh Vod.
S. V. Monakova.
Gidrobiol Zh 11(3), p 55-59, 1975.

Descriptors: *Acids, Reservoirs, Seaso Benthos, Water pollution effects.
Identifiers: *Bottom deposits, *Fatty ac USSR, Volatile fatty acids, *Rybinsk Re voir(USSR), Volga River(USSR), Formic a Acetic acid.

The bottom deposits of the Rybinsk reservoir the Volga (USSR) contain formic, ace propionic, butyric, valeric and caproic acids.

ntents of formic and acetic acids are 1-2 orders gher than the others. There was a decrease in the ntent of acids in late summer-early fall and a arked increase before freezing. No relationship as established between the type of bottom posits and quantity of volatile fatty acids.--pyright 1976, Biological Abstracts, Inc.
77-00126

HANGE OF BENTHIC COMPLEXES UNDER HE EFFECT OF OVERGROWTH IN UTROPHIC LAKE BALTYM, (IN RUSSIAN),
. P. Koval'Kova.
kologiya 6(3), p 80-82, 1975.

escriptors: *Eutrophication, *Benthos, Lakes, Diptera, *Fish stocking.
entifiers: Chironomus-Biappendiculatus, hironomus-Semireductus, *Endochironomus-Alpennis, Macrophytes, Tanytarsus-Gregarius, hite amur, *Biocenoses, *Lake Baltyn(USSR).

ng-term observations were made of the effect the benthic fauna of the overgrowth of Lake ltym (area 753 ha, average depth 3.4 m. maxum depth 6.5 m) located on the eastern slope of e central Urals, 23 km from Sverdlovsk (USSR). uring the past 30 yr the overgrowth of the lake s increased from 15-85%, as a result of which e established biocenoses have undergone conderable reorganization. For example, in 1948 the mplex Chironomus f. 1. semireductur + Tanyrsus gr. gregarius dominated in the benthos, hereas from 1962 the dominating role was played the complex Endochironomus albipennis + hironomus biappenpendiculatus. The pelophilic ocenose of benthic organisms was replaced by a ytophilic one. The foraging conditions of the h deteriorated and their growth and condition clined. Stocking of the white amur and renewal net fishing have reduced the overgrowth of the ke by macrophytes, which in turn has improved e benthic biocenoses.--Copyright 1976, Biologil Abstracts, Inc.
77-00140

RESENT STATE OF ZOOPLANKTON AND OOBENTHOS OF LAKE ADZHIKABUL, (IN USSIAN),
r primary bibliographic entry see Field 2H.
77-00142

UMBER, GENERATION TIME AND PRODUCON OF BACTERIA IN WATER OF THE RATOV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii nutrennykh Vod.
N. Dzyuban.
drobiol Zh 11(3), p 14-19. Illus. 1975.

scriptors: *Distribution patterns, *Bacteria, licroorganisms, Seasonal, Reservoirs, Detritus, roductivity, Path of pollutants.
ntifiers: Russian-Sfsr, USSR, Saratov Reserr(USSR).

e distribution pattern of microorganisms in the ervoir (Russian SFSR, USSR) is determined to arge extent by its cascade arrangement. The al number of bacteria in it, as compared with t in the river before the improvement, reased by 1-2 million/ml of water. The number saporphytic microorganisms becoame several es as low due to a drop in the flow velocity and imentation of suspensions, with bacteria athed to them, and by a decrease in microflora detritus income from the flood bed. Seasonal nges in the microflora amount in the reservoir insignificant. Bacterial generation time varied hin 7-31 h. The significant production was 0.93mg/l on the average.--Copyright 1976, Biologi Abstracts, Inc.
7-00143

A FOUR-YEAR ANALYSIS OF VEGETATION FOLLOWING AN OIL SPILL IN A FRESHWATER MARSH,
Smith Coll., Northampton, Mass. Dept. of Biological Sciences.
C. J. Burk.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 766, Price codes: A03 in paper copy, A01 in microfiche. University of Massachusetts Water Resources Research Center, Amherst, WRRC Pub. No. 71, Completion report FY-76-15, June 1976. 38 p, 6 fig, 13 tab, 17 ref. OWRT A-042-MASS(2). 14-31-0001-5021.

Descriptors: *Freshwater marshes, Salt marshes, *Marsh plants, Water pollution effects, *Oil spills, Plant groupings, *Vegetation, Oil pollution.
Identifiers: Annual plant species, Perennial plant species.

Changes in the composition of vegetation occurring in a freshwater marsh were studied for four years following an accidental oil spillage. Total plant cover and diversity measured by species richness, mean species per quadrat, and the Shannon-Wiener function were progressively reduced in both high and mid-marsh zones for two years after the spillage. Eighteen of the species found before the spill were not found the season following. Perennial species tended to be less affected by the oil immediately following the spill than annual species. The species most markedly reduced included: Cephalanthus occidentalis, Eleocharis acicularis, Leersia oryzoides, Ludwigia palustris, Marsilea quadrifolia, Onoclea sensibilis, Pilea fontana, and Pontederia cordata. Specie essentially unaffected or increasing the season after the oil spill included: Ceratophyllum demersum, Dulichium arundinaceum, Eleocharis palustris, Elodea nuttallii, Lysimachia terrestris, Nuphar variegatum, Polygonum coccineum, Potamogeton epihydrus, and Sagittaria latifolia. The results are discussed in relation to work on the effects of oil spillage on saltmarsh vegetation.
W77-00147

FORT RIVER ECOSYSTEM: PRODUCTIVITY OF THE PERIPHYTON COMPONENT,
Massachusetts Univ., Amherst. Water Resources Research Center.
S. G. Fisher, and W. T. Summer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 772, Price codes: A04 in paper copy, A01 in microfiche. WRRC Pub. No. 72, Completion Report FY-76-16, June 1976. 58 p, 7 fig, 2 tab, 62 ref. OWRT A-068-MASS(1). 14-31-0001-4021.

Descriptors: *Primary productivity, *Periphyton, Streams, Ecology, Ecosystems, *Massachusetts, New England, Light, Water temperature, *Chlorophyll, Monitoring, Respiration, Standing crops, Nutrients, Metabolism.
Identifiers: *Fort River(Mass).

The primary production and general ecology of the periphyton community of a New England lowland stream were studied over a 17-month period. Temperature, discharge, stream bed light, periphyton chlorophyll, and community structure data were monitored regularly. Mean stream bed chlorophyll concentrations ranged from 10 to 136 mg/m2 (annual mean = 44 mg/m2). Seasonally distinct chlorophyll peaks coincided with stream bed light maxima occurring in early May, just prior to leaf out, and again in autumn after leaf fall. However, during midwinter, despite low light levels and high stream discharge, mean chlorophyll concentrations remained higher than summer values. At any given time of the year, stream bed rock-size better accountedfor variations of chlorophyll concentrations between different stream sites than either light or current velocity. Productivity chambers were used to measure productivity and respiration rates of stream periphyton communittee in situ. Periphyton colonized on natural substrates were incubated within these chambers at various temperatures, light intensities and periphyton densities throughout an annual period. Periphyton community respiration was a function of temperature and benthic chlorophyll densities. The summer decline in periphyton standing crop, characteristic of many small streams is discussed. In Fort River, light, discharge, and grazing factors were not sufficient to explain this phenomenon. Although seasonal patterns of stream nutrient concentrations are not associated with seasonal variations in periphyton standing crop, at higher temperatures when increased rates of metabolism and nutrient uptake occur, nutrient limitation becomes more important. This effect is especially important for dense stands of periphyton where much of the population is sheltered from the current, and accounts for both the temperature dependence of the periphyton density to PG/chlor relationship and the low summer periphyton standing crop.
W77-00149

AGRICULTURAL RUNOFF AS A SOURCE OF HALOMETHANES IN DRINKING WATER,
Iowa Univ., Iowa City. State Hygienic Lab.
For primary bibliographic entry see Field 5B.
W77-00163

ASSESSMENT OF PRACTICALITY OF REMOTE SENSING TECHNIQUES FOR A STUDY OF THE EFFECTS OF STRIP MINING IN ALABAMA,
Alabama Univ., University. Dept. of Geology and Geography.
T. H. Hughes, A. C. Dillion, III, J. R. White, Jr., S. E. Drummond, Jr., and W. G. Hooks.
Available from the National Technical Information Service, Springfield, Va 22161 as N76-15534, Price codes: A09 in paper copy, A01 in microfiche. Final Report, July 1, 1973-June 30, 1975. 190 p, 41 fig, 25 tab, 56 ref, 4 append. NASA 1-3-80-0084(1F), NASA NAS8-29936.

Descriptors: *Remote sensing, *Strip mines, *Erosion, *Sedimentation, *Mine drainage, Alabama, Acid mine water, Vegetation, Equations, Rill erosion, Gully erosion, Sheet erosion, Mining, Aerial photography, On-site investigations, Geochemistry, Chemical analysis, *Pollutant identification.
Identifiers: Mining reclamation, Strip mining effects.

The areal extent of strip mining was measured from aerial photographs for two mining areas. Reclamation by grading and revegetation was also observed on these photographs. Twenty slopes were selected within the Searles Area for measurement of the amount of material removed by rill and gully erosion. Three stages in the evolution of rill and gully channel profiles were recognized: Stage 1, the rill stage lasts three to six years after mining. Stage 2, the intermediate stage, lasts six to eight years. Stage 3, the gully stage begins twelve to fifteen years after mining. The volume of sediment in Bluff Creek was obtained by three methods: (1)Direct measurement, in the field, of the width and depth of sediment in the stream valley, construction of cross-sections and projections of average cross-sectional areas through the distance separating adjacent cross-sections; (2)Measurement and projection of the areas contained in stream terrace deposits; (3)From the measured cross-sections, an empirical equation was derived that relates the cross-sectional area to the width of the stream valley. A model for the production of acid mine water was developed. Samples of mine drainage from 22 stations were collected and analyzed. (Sims-ISWS)
W77-00170

SURFACE NUTRIENTS, CHLOROPHYLL-A AND PHAEOPIGMENT IN SOME SCOTTISH SEA LOCHS,
Dunstaffnage Marine Research Lab., Oban (Scotland).

L. Solorzano, and B. Grantham.
Journal of Experimental Marine Biology and Ecology, Vol. 20, No. 1, p. 63-76, 1975. 8 fig., 20 ref.

Descriptors: *Nutrients, *Chlorophyll, *Pigments, *Saline water-freshwater interfaces, Phytoplankton, Spring, Nitrates, Phosphates, Silicates, Freshwater, Productivity, Limiting factors, Inflow, Turbulence, Estuaries, Water circulation, Salinity, Europe, Runoff, Euphotic zone, Eutrophication.
Identifiers: *Phaeopigments, Loch Creran(Scotland), Loch Etive(Scotland), Loch Linnhe(Scotland).

The influence of freshwater runoff on concentration and distribution of nutrients, chlorophyll, and phaeopigments during spring phytoplankton blooms in Lochs Creran, Etive, and Linnhe, Scotland, was studied. Nitrate, phosphate, and silicate concentrations were related to fluctuations in freshwater input and uptake by phytoplankton populations. Nitrate to phosphate and silicate ratios in Lochs Creran and Linnhe were similar, but values for Loch Etive were markedly different. Nitrate, not phosphate, was a critical factor in productivity of Lochs Creran and Linnhe. Limitation of these nutrients in Loch Etive was directly affected by the amount of freshwater entering the loch. Patchiness in chlorophyll and phaeopigments in Lochs Creran and Etive reflected factors, such as freshwater/seawater inflow, turbulance produced by loch topography, etc., which affect loch surface circulation. Delay in development of phytoplankton blooms in Loch Linnhe may be due to poor surface layer stability due to low runoff. Freshwater input is the most important factor determining initiation and support of phytoplankton populations; it adds nutrients, trace metals, and growth promoting factors; increases water column stability; and keeps cells in the euphotic zone. When freshwater runoff is relatively high, it increases phytoplankton dispersion in the zone of better illumination outside lochs, thus expanding production. (Buchanan-Davidson-Wisconsin)
W77-00182

COMPOSITIONAL CHANGES OF A FUEL OIL FROM AN OIL SPILL DUE TO NATURAL EXPOSURE,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5B.
W77-00183

THE INFLUENCE OF HYDROLOGICAL CONDITIONS ON DISSOLVED AND SUSPENDED CONSTITUENTS IN THE MISSOURI RIVER,
Wisconsin Univ., Madison. Lab. of Hygiene.
J. J. Delfino, and D. J. Byrnes.
Water, Air, and Soil Pollution, Vol. 5, No. 2, p. 157-168, 1975. 1 fig., 2 tab., 28 ref.

Descriptors: *River flow, *Dissolved solids, *Suspended solids, *Missouri River, *Runoff, *Nebraska, Water quality, Chemical properties, Silica, Conductivity, Sodium, Calcium, Ions, Alkalinity, Chlorides, Sulfates, Turbidity, Nitrogen compounds, Phosphorus, Oxygen demand, Agricultural watersheds, Carbon, Potassium, Iron, Manganese, Zinc, Copper, Cations.

The variability in flow characteristics of a stretch of the Missouri River near Brownville, Nebraska, were studied over a three year period from 1970-1972. River discharges ranged from 10,000 cfs. The river's chemical composition was strongly influenced by discharge conditions through dilution of normal concentrations by runoff from rain and snowmelt or enhancement through suspended solids carried from land and scoured from the river bottom. Generally increased river discharge caused by runoff decreased the concentration of major dissolved ionic constituents in the river—total dissolved solids, ammonia, soluble orthophosphate, sodium calcium, bicarbonate alkalinity, chloride, and sulfate. Turbidity, total suspended solids, total organic nitrogen, total phosphorus, chemical and biochemical oxygen demand, total organic carbon, potassium, iron, manganese, zinc, and copper concentrations became elevated with higher discharges; these values could be strongly correlated with total suspended solids in 1972. Since the major land use is agricultural, the investigation results should be considered when attempts are made to control nonpoint pollution sources. Data must be used cautiously when applying the results of a single sampling analysis in geochemical transport calculations due to the extreme variability in concentrations. (Buchanan-Davidson-Wisconsin).
W77-00184

ISOLATION AND IDENTIFICATION OF BLUE-GREEN ALGAE PRODUCING MUDDY ODOR METABOLITES, GEOSMIN, AND 2-METHYLISOBORNEOL, IN SALINE LAKES IN MANOTOBA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W77-00185

ALGAL PRODUCTIVITY IN 49 LAKE WATERS AS DETERMINED BY ALGAL ASSAYS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
W. E. Miller, T. E. Maloney, and J. C. Greene.
Water Research, Vol. 8, p. 667-679, 1974. 11 fig., 7 tab., 12 ref.

Descriptors: *Eutrophication, Analytical techniques, *Lakes, *Bioassay, *Trophic level, Limiting factors, Calcium, Magnesium, Alkalinity, Carbon, Phosphorus, Nitrogen, Iron, Essential nutrients, Hardness(Water), *Pollutant identification, Water pollution effects, *Productivity.
Identifiers: Selenastrum capricornutum, *Algal assays, *Algal productivity.

Algal assays were done on samples from 49 American Lakes to determine the limiting factor in algal productivity. There was high correlation between the trophic state of 23 lakes and the algal assay productivity response. No correlation was noted between calcium, magnesium, alkalinity, and carbon increases and the maximum yield of Selenastrum capricornutum in the samples. Phosphorus was limiting in 35 lakes, nitrogen in 8 lakes, and other nutrients in 6 lakes. Generally phosphorus limitation decreased as the lake's trophic state increased: 83% of low, 75% of moderate, 64% of moderately high, and 50% of high productivity lake waters were phosphorus-limited for algal growth. Lake waters with high orthophosphate concentrations are more likely to become algal growth-limited by nitrogen or another nutrient. In the presence of other essential nutrients, addition of 1.00 mg nitrogen and 0.05 mg phosphorus/liter should support 20-30 mg algal dry weight/liter. Only 5 of 11 autoclaved-filtered low productivity waters supported this much algal growth with nitrogen and phosphorus supplements, indicating that other nutrients were limiting or a toxicity factor was present. Manganese in autoclaved-filtered Lake Herman water inhibited algal growth. It is not known if manganese was directly toxic to the test algae or if it restricted the availability of essential nutrients. (Buchanan-Davidson—Wisconsin)
W77-00187

EFFECTS OF OIL ON THE REPRODUCTION OF THE AMPHIPOD GAMMARUS OCEANICUS,
Swedish Water and Air Pollution Research Lab., Nykoping. Baltic Sea Lab.
O. Linden.
Ambio, Vol. 5, No. 1, p. 36-37, 1976. 1 tab., 1 fig., 7 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Reproduction, *Amphipoda, Marine animals, Toxicity, Incubation, Larvae, Broods, Animal behavior, Fecundity.
Identifiers: *Gammarus oceanicus, Sub-lethal effects, Crude oil.

Long-term effects of sub-lethal amounts of crude oil on the reproduction of Gammarus oceanicus are described. When couples in the precopula stage were exposed to low oil levels in water length of incubation was unaffected, but fewer larvae were produced by females exposed to oil. The percentage reduction in brood number was about 50% with smaller females and 20% with long females; in absolute numbers the reduction was similar for all sizes of females. Couples in the precopula stage were separated, then brought together in water containing 1, 10, 20, or 4 microliters of oil per liter of water. In unpolluted sea water and the lowest oil concentration, the male grasped the female shortly after introduction by 24 hours all the couples had reentered into the precopulation stage. With higher oil concentrations, no couples were observed in the precopulation stage, except at the end of the experiment in samples containing 10 microliters oil/liter. The frequency with which the male and the female enter the precopulation stage, which is necessary for successful fertilization, decreased in the presence of low oil concentrations. Reduced fecundity due to sub-lethal concentrations of oil pollutants has serious ecological consequences. (Buchanan-Davidson—Wisconsin)
W77-00188

EVALUATION OF THE TOXICITY OF SUBSTANCES BEING RELEASED INTO WATER BODIES FOR THE EARLY DEVELOPMENT OF FISH, (IN RUSSIAN),
Moscow State Univ. (USSR). Lab. of Water Toxicology.
O. P. Danil'Chenko, and N. S. Stroganov.
Vopr Ikhtiol 15(2), p 346-355, 1975.

Descriptors: *Toxicity, Water pollution effects, Embryonic growth stage, Chlorides, Fish, Perch, Identifiers: Acerina-Cernua, Cobitis-Taenia, Esox-Lucius, Gobio-gobio, Misgurnus-fossilis, Perca-Fluviatilis, Phoxinus-phoxinus, Rutilis-rutilis, *Salicylanilide, *Antiseptics, *Triethyltin chloride, Sodium pentachlorophenate, Roach.

Results are presented of an investigation of the effect of 3 antiseptics, tritheyltin chloride, salicylanilide and sodium pentachlorophenate, on the embryonic and early postembryonic development of freshwater fishes: pike (Esox lucius), perch (Perca fluviatilis), ruff (Acerina cernua), roach (Rutilus rutilus), elritze (Phoxinus phoxinus), gudgeon (Gobio gobio), loach (Misgurnus fossilis) and spiny loach (Cobitis taenia). An evaluation of the degree of toxicity of these substances in water bodies with respect to their effect on the early development of these fishes is given.—Copyright 1976, Biological Abstracts, Inc.
W77-00189

THE GROWTH-PROMOTING ACTIVITY OF SOME ALGAL METABOLITES ON SCENEDESMUS ACUTUS,
Bulgarian Academy of Sciences, Sofia. Experimental Algology Section.
G. Zolotovich, G. Ilkov, and T. Toncheva.
Proceedings of the Bulgarian Academy of Sciences, Vol. 28, No. 9, p. 1253-1256, 1975. 2 fig., 1 tab., 6 ref.

Descriptors: *Plant growth substances, *Algae, *Metabolism, *Scendesmus, Alcohols, Bacteria, Laboratory tests.
Identifiers: Scenedesmus acutus, *Algal metabolites

The sesquiterpene alcohol farnesol, aromatic b phenyl-ethyl alcohol, and ketole 4-hydroxy

methyl-pentanone (diacetone alcohol) were identified in extracts from the green alga Scenedesmus acutus, strain Tomaselli 8. Biological effects of these metabolites on Scenedesmus growth for 90 days were determined. Increase in dry matter was the most marked biological effect. Farnesol caused the largest increase followed by diacetone alcohol and phenyl-ethyl alcohol. Cell counts also increased. Cell lengths increased with phenyl-ethyl alcohol and diacetone alcohol. All treated cells were rounded off. Therefore increased dry weights were due to increased cell dimensions, rather than cell numbers. In all treated cultures, cell dimensions and numbers were about the same on the fifteenth and nineteenth days, but dry matter decreased. All substances inhibited bacterial flora. Color changes suggested changes in the algal physiological state. More colonies developed with inoculations of treated cultures, indicating that the treated cells were in better condition; more colonies were obtained with phenyl-ethyl alcohol and fewer with farnesol. Their effects on growth were the same for the entire cultivation period. It is assumed that these materials accelerate ontogenetic development or increase autospore numbers. (Buchanan-Davidson--Wisconsin)
W77-00190

THE EXTRA 02 EVOLVED DURING NITRATE UTILIZATION BY CHLORELLA,
Centre d'Etudes Nucleaires de Cadarache, Saint Paul-lez-Durance (France). Department de Biologie.
R. Gerster, G. H. Lorimer, and B. Vennesland.
Plant Science Letters, Vol. 5, No. 4, p. 255-260, 1975. 1 fig., 1 tab., 8 ref.

Descriptors: *Oxygen, *Nitrification, *Chlorella, *Chlorophyta, Oxygen isotopes, Ammonia, Carbon dioxide, *Algae, Mass spectrometry, *Pollutant identification.
Identifiers: *Oxygen evolution.

Nitrate reduction by green algae and higher plants occurs in two steps, catalyzed by nitrate reductase and nitrite reductase. When nitrite reductase catalyzes reduction of nitrite to ammonia, six electrons are required. Four of the six electrons involved might come from the oxygen atoms of nitrite; the oxygen atoms from nitrite might contribute to oxygen evolved by chloroplasts. Because of nitrite oxygen instability, the green alga, Chlorella vulgaris, was fed nitrate-018. Nitrate addition to illuminated cells caused increased oxygen evolution in the presence and absence of added carbon dioxide. Nitrate oxygen did not contribute any significant label to oxygen evolved when nitrate was reduced. The rate of oxygen evolution measured in the presence of carbon dioxide and nitrate was larger than the sum of the rate measured with nitrate alone plus the rate measured with carbon dioxide alone. Either carbon dioxide utilization was stimulated by nitrate or nitrate utilization was stimulated by carbon dioxide, even in cells already rich in carbohydrate. Net carbon dioxide utilization decreased and/or carbon dioxide production increased during nitrate utilization. The net amount of extra oxygen evolved during nitrate reduction in the presence of carbon dioxide was 2.6 micromoles of oxygen. (Buchanan-Davidson--Wisconsin)
W77-00191

SUBSTITUTE CHEMICAL PROGRAM: INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF MALATHION.
Midwest Research Inst., Kansas City, Mo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 818, Price codes: A12 in paper copy, A01 in microfiche. Report EPA-540/1-75-005, March 1975. 260 p. 5 fig., 41 tab., 363 ref.

Descriptors: *Environmental effects, *Pesticides, *Pesticide kinetics, *Evaluation, Pesticide toxicity, Crop response, DDT, Safety, Economic efficiency, Hydrolysis, Hazards, Oxidation, Formulation, Degradation(Decomposition), Pesticide residues, Regulation, Pathology, Lethal limit.
Identifiers: *Malathion, Pharmacology, Toxicology, Tolerance levels.

An initial scientific and microeconomic review, conducted to determine if there is sufficient data to make a judgment with respect to the safety and efficacy of Malathion as a registered substitute for DDT, is detailed. Its production and chemical formulation, use, pharmacology, toxicology, food tolerances, acceptable intakes, its fate and significance in the environment, use hazards, and an assessment of the efficacy and cost effectiveness are presented. Its environmental effects are evaluated in connection with its effect on aquatic life, wildlife, beneficial insects, residues in soil, water, and air, and nontarget plants; also discussed is its bioaccumulation, biomagnification, degradation, and environmental transport mechanisms. The federal and state regulations concerning its use; and its use patterns in agriculture (by major crops and regions), industry, governmental agencies, home and garden uses are presented. The basic producer of Malathion is the American Cyanamid Company and its estimated production volume in 1972 was 24 million pounds of active ingredients. Import volume was 153,769 pounds in 1972; the 1972 export volume is estimated to have been 8 million pounds of active ingredient. Figures are incomplete, thus care should be taken in interpreting results. This report represents a summary of scientific data obtained from various sources. (Auen-Wisconsin).
W77-00192

THE BENTHIC ECOLOGY OF LOCH LINNHE AND LOCH EIL, A SEA-LOCH SYSTEM ON THE WEST COAST OF SCOTLAND. IV. CHANGES IN THE BENTHIC FAUNA ATTRIBUTABLE TO ORGANIC ENRICHMENT,
Dunstaffnage Marine Research Lab., Oban (Scotland).
T. H. Pearson.
Journal of Experimental Marine Biology and Ecology, Vol. 20, No. 1, p. 1-41, 1975. 12 fig., 8 tab., 25 ref.

Descriptors: *Benthic fauna, *Succession, *Water pollution effects, *Organic matter, Pulp wastes, Anaerobic conditions, Biochemical oxygen demand, Biological communities, Biomass, Suspended solids, Varieties, Dominant organisms, Europe, Estuaries, Eutrophication.
Identifiers: *Loch Linnhe(Scotland), *Loch Eil(Scotland).

Effects of pulp and paper mill effluents on benthic fauna of Lochs Linnhe and Eil due to organic enrichment of sediments, were studied. The effluent affected the system because of short-term biochemical oxygen demands caused by dissolved organic material in the effluent and long-term biochemical oxygen demands due to suspended solids, primarily macerated wood fiber. As organic enrichment increased, certain species were progressively eliminated and surviving species increased in numbers. Later species not usually in the original fauna immigrated and appeared specifically associated with sediments having very high organic contents. In the last succession stage even the specialized 'high organic' fauna was eliminated. Excessive organic deposition caused anoxic conditions at the sediment-water interface which resulted in elimination of all but a few annelid species. Minor variations in sediment type or salinity may initially cause benthic population changes at low levels of organic detrital input but they are overshadowed when organic matter input is increased the described successional changes are discussed in the light of recent hypotheses concerning ecological change in relation to environmental stress. (See also W72-03003) (Buchanan-Davidson--Wisconsin)
W77-00196

THE USE OF ERTS-1 TO MORE FULLY UTILIZE AND APPLY MARINE STATION DATA TO THE STUDY AND PRODUCTIVITY ALONG THE EASTERN SHELF WATERS OF THE UNITED STATES,
Old Dominion Univ. Research Foundation, Norfolk, Va.
For primary bibliographic entry see Field 5A.
W77-00198

TECHNIQUES FOR ANALYSIS OF PARAFFIN HYDROCARBONS AND FOR INTERPRETATION OF DATA TO ASSESS OIL SPILL EFFECTS IN AQUATIC ORGANISMS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5A.
W77-00219

DETERMINATION OF N-ALKANE AND METHYLNAPHTHALENE COMPOUNDS IN SHELLFISH,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5A.
W77-00220

EXPERIMENTAL ECOSYSTEMS TO MEASURE FATE OF OIL SPILLS DISPERSED BY SURFACE ACTIVE PRODUCTS,
Institut Francais du Petrole, Rueil-Malmaison (France).
For primary bibliographic entry see Field 5B.
W77-00251

A REINVESTIGATION OF SOUTHERN CALIFORNIA ROCKY INTERTIDAL BEACHES THREE AND ONE-HALF YEARS AFTER THE 1969 SANTA BARBARA OIL SPILL: A PRELIMINARY REPORT,
University of Southern California, Los Angeles. Allan Hancock Foundation.
R. Cimberg, S. Mann, and D. Straughan.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 697-702, 2 fig, 1 tab, 17 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Environmental effects, *Aquatic animals, *Aquatic plants, California, Beaches, Intertidal areas, Sediments, Mortality.
Identifiers: *Outer Continental Shelf, Biological effects, *Santa Barbara(CA), Substrates, Tide pools, Balanus, Chthamalus, Enteromorphia, Chaetomorpha, Ulva, Ralfsia, Porphyra, Endocladia, Hildenbrandia, Rhodoglossum.

Ten rocky intertidal beaches in southern California, which were surveyed for a 12-month period following the 1969 Santa Barbara oil spill, were reinvestigated in June and July of 1972. Data from this 1972 survey as well as data collected during the same months on the same beaches in 1969 and 1970 were analyzed by forming beach groupings using cluster analysis. This analysis indicates that sand movement and substrate stability are the two most important factors affecting the presence of marine organisms on these beaches during this period. Overall, the effect of the 1969 Santa Barbara oil spill on the presence and abundance of rocky intertidal organisms was less important than other environmental factors. Most mortalities reported were localized in tide pools and high intertidal areas. (See also W76-09312) (Sinha-OEIS)
W77-00267

THE RESPONSE OF MACROINVERTEBRATES TO GASOLINE POLLUTION IN A MOUNTAIN STREAM,
Environmental Protection Agency, Kansas City, Mo. Surveillance and Analysis Div.
S. L. Bugbee, and C. M. Walter.

In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 725-731, 1 fig, 3 tab, 4 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Gasoline, *Streams, *Toxicity, *South Dakota, Aquatic animals, Aquatic plants, Mountains, Sediments.
Identifiers: Biological effects, Aviation gasoline.

On November 23, 1969, a gasoline transport truck overturned on the U.S. Highway 16 bridge crossing Grace Coolidge Creek east of Custer in South Dakota, discharging an estimated 5,000 gallons of aviation gasoline to the stream. Immediately following the spill, the gasoline was flushed downstream with large volumes of water to reduce the fire hazard in the park area. The sudden increase in flow thoroughly mixed the gasoline in the stream incorporating some fractions into the sediments. The majority of aquatic invertebrates and about 2,500 fish (30% trout species) were killed for at least two miles downstream from the spill. Gasoline residues in the sediments on the rocks prohibited the recolonization of mayflies, stoneflies and certain caddisflies for at lease six months following contamination. The midge Orthocladius was the most resistant organism. The reappearance of mayfly and stonefly nymphs in the contaminated reach of the stream 12 months after the spill indicated a significant degree of recovery in the macroinvertebrate community. The persistence of gasoline in the stream bed six months after the spill as well as the restricted rate of recolonization of macroinvertebrates demonstrates complicated, long-term problems resulting from the interaction of petroleum products with the environment. (See also W76-09312) (Sinha-OEIS)
W77-00268

TERRESTRIAL OIL SPILLS IN ALASKA: ENVIRONMENTAL EFFECTS AND RECOVERY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
P. G. Hunt, W. E. Rickard, F. J. Deneke, F. R. Koutz, and R. P. Murrman.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 733-740, 12 fig, 16 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Environmental effects, *Ecosystems, *Permafrost, *Microbial degradation, *Alaska, Vegetation, Pipelines.
Identifiers: *Biological effects, Petroleum, Nitrobacter, Nitrosomonas, Crude oils.

Damage and natural recovery of terrestrial ecosystems affected by refined petroleum spills along the Haines to Fairbanks military pipeline in Alaska were investigated. Mosses and trees were completely killed, and vegetation is now sparse in the drier portions of the spill areas. Some new vegetation is growing in drainage pathways. The dead organic mat has provided adequate insulation, and only a few instances of slope instability where slopes exceed 20%, occurred. Through laboratory studies on the rates of microbial respiration in Fairbanks silt containing 15% Prudhoe crude, it was determined that microbial activity is increased by inoculation with mixed-culture oil-degrading microorganisms, increased pH, and phosphorus additions. Microbial activity also responds positively to nitrogen addition after an initial negative response. (See also W76-09312) (Sinha-OEIS)
W77-00269

A STUDY OF THE EFFECTS OF THE SAN FRANCISCO OIL SPILL ON MARINE ORGANISMS,
College of Marin, Kentfield, Calif.
G. L. Chan.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 741-781, 26 fig, 13 ref, 15 append.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Environmental effects, *California, Aquatic animals, Reefs, Aquatic plants, Mussels, Intertidal areas, Beaches, Shores, Coasts, Bays.
Identifiers: *Outer Continental Shelf, Biological effects, Collisions, Littorina spp. Acmaeca spp. Mytilus, Balanus, Urospora, Endocladia, Gigartina, Phyllospadix, Tegula, San Francisco Bay(Calif).

The San Francisco oil spill occurred on January 18, 1971, during the early morning hours when two Standard Oil vessels collided almost directly under the Golden Gate Bridge, releasing 840,000 gallons of Bunker C fuel. This asphalt-like oil was washed up on intertidal shores of the area. The oil was heavily deposited on the Duxbury Reef's mussel beds and high tidal berm rocks. It was determined that marine organisms died from being smothered by the oil, with certain species, such as acorn barnacles and limpets, suffering the highest mortality at Sausalito and on Duxbury Reef. Comparison of pre-oil and post-oil transect counts showed there was a significant decrease in marine life after the oil spill on the reef. Marine snails suffered less mortality than the sessile barnacles and other sedentary animals. The normally large population of striped shore crabs is missing from the rocky crevices. Finally, marine algal blooms were also observed in certain reef localities. The present conditions of Duxbury Reef (December, 1971) is one of apparent good health; the recruitment of some marine animals appear to be approaching normal levels. The oil has disappeared from much of the reef surfaces and is barely discernible in the most heavily deluged areas. (See also W76-09312) (Sinha-OEIS)
W77-00270

INTERAGENCY INVESTIGATIONS OF A PERSISTENT OIL SPILL ON THE WASHINGTON COAST,
National Marine Fisheries Service, Seattle, Wash.
R. C. Clark, Jr, J. S. Finley, B. G. Patten, D. F. Stefani, and E. E. DeNike.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 793-808, 12 fig, 5 tab, 18 ref.

Descriptors: *Oil pollution, *Oil spills, *Water pollution effects, Aquatic animals, Aquatic plants, *Environmental effects, *Washington, Coasts, Beaches, Intertidal areas, Crabs, Algae.
Identifiers: *Outer Continental Shelf, Biological effects, Urchins, Barnacles, Paraffin hydrocarbons, Petroleum hydrocarbons, Fuel oil, Mitella polymerus, Strongylocentrotus purpuratus, Hemigrapsus nudus, Fucus gardneri.

An interagency team of biologists, chemists, oceanographers and engineers investigated the long-term effects of oil spilled by the grounding of the troopship GENERAL M.C. MEIGS January 6, 1972, on an ocean coast intertidal community of plants and animals. Oil was released from the 440,000 liters of Navy Special Fuel Oil carried by the vessel. A series of sites, forming a vertical profile of the rocky shelf area from the upper intertidal zone to the lowest low tide level in Wreck Cove was studied. This report describes the preliminary findings of the first ten months (January-October, 1972) of the investigation. Abnormal and dead urchins indicated that this species was affected. Loss of fronds and bleached thalli not evident in control areas were observed in the plant community in the immediate vicinity of the hulk. Petroleum hydrocarbons were taken up in the intertidal community. The normal paraffin hydrocarbon patterns and content over the range n-C14H30 to n-C37H76 of healthy-appearing goose barnacles, crabs, and an alga display the same basic characteristics as the fuel oil which had been lost. (See also W76-09312) (Sinha-OEIS)
W77-00271

CHROMOSOME MUTAGENESIS IN DEVELOPING MACKEREL EGGS SAMPLED FROM THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
A. C. Longwell.
NOAA Technical Memorandum ERL MESA-7, April 1976. 64 p, 4 tab, 16 plates, 106 ref.

Descriptors: *Fish eggs, *Water pollution effects, Heavy metals, Fishes, Cadmium, Pesticides, Metals, Radiation, *Embryonic growth stage, Sampling.
Identifiers: *Chromosome abnormalities, *Mutagenesis, *Genetic damage, *Mutagens, *New York Bight, *Mackerel eggs, Scomber scombrus, Cyto-genetics, Chromosome mutagenesis, Atlantic mackerel.

Altogether 30,689 embryo cells were scored in 45 eggs from the 14 different stations in the New York Bight collected from surface waters during the May 7-18, 1974 cruise of the Westward. Less than 20% of the eggs had all their dividing cells free from chromosome and division abnormalities. One-third of the 30,689 division figures scored for all the embryos were abnormal. All but an insignificant number of eggs sampled were those of Scomber scombrus, the Atlantic mackeral. Abnormalities of the chromosomes extended through the entire range of radiomimetic effects on the chromosomes and their division apparatus, including extreme stickiness of chromosomes having obvious division difficulties and irregularities, failure of chromosomes to orient on spindles, with consequent loss of chromosomes, and chromosome breakage. Not all chromosome or division irregularities are microscopically detectable even with the most refined methods. Only a portion of observable abnormalities would be expected to be recorded with the cyto-genetic scoring system used in this study. The collection of the Westward data on largely the early embryo stage means that the earlier stage zygotes, so chromosomally abnormal that they could not gastrulate, are not represented. Differences between best and worst stations are so minimized. (NOAA)
W77-00274

EFFECTS ON COMMERCIAL FISHING OF PETROLEUM DEVELOPMENT OFF THE NORTHEASTERN UNITED STATES,
Woods Hole Oceanographic Institution, Mass. Marine Policy and Ocean Management Program.
D. W. Allen, R. B. Allen, R. E. Black, J. M. Friedman, and L. G. Mallon.
Report No. WHOI-76-66, April 1976. 80 p, 40 fig, 11 tab, 96 ref. SG-04-6-158-44016.

Descriptors: *Northeast US, *Commercial fishing, *Oil pollution, *Oil spills, *Water pollution effects, *Fisheries, *Environmental effects, *Continental Shelf, *Resources development, Oil industry, International law, Damages, Compensation, Jurisdiction.
Identifiers: *Outer Continental Shelf, Northeast US Coast, Baltimore Canyon, Georges Bank, New England States, Offshore technology, Environmental impact.

A study of the possible effects of future offshore petroleum development on the commercial fishing industry of the New England and Mid-Atlantic states is reported. The study was based on a variety of sources: two workshops involving fishermen, government officials and oil industry representatives; visits to the Gulf of Mexico and the North Sea; interviews with state coastal zone planning officials and with federal officials responsible for offshore development; interviews

vith and questionnaires from fishermen; and inally, the analysis of existing fisheries data and he review of previous studies. The report con-iders the effects on fisheries in three general ategories: offshore interactions, onshore interac-ions, and pollution effects. Estimates are made of he probable magnitude of these effects on com-nercial fishermen and recommendations are made o minimize undesired consequences. The report lso contains general descriptions of the physical nvironment on the continental shelf of the area; he commercial fishing industry; the technology of he petroleum industry; and the legal and regulato-y framework governing the industries on the con-inental shelf. (NOAA)
V77-00280

:HANGE OF THE BIOCHEMICAL COMPOSI-'ION OF MUSSELS UNDER CONDITIONS OF :EGULATED FLOW OF THE DNIEPER, (IN :USSIAN),
Akademiya Nauk URSR, Kiev. Instytut lidrobiologii.
'. I. Birger, and A. Ya. Malyarevskaya.
iidrobiol Zh 11(3), p 72-76, 1975.

)escriptors: *Mussels, Biochemistry, Reservoirs, Bioindicators, Protein, Regulation, *Reservoir peration.
dentifiers: Ash, Dreissena-Bugensis, Dreissena-olymorpha, USSR, *Dnieper River(USSR), aloric content.

he effect of the regulated flow of the Dnieper iver (USSR) in the variability of the biochemical omposition of mussels, Driessena polymorpha nd D. bugensis was determined. During the 1st ears after construction of the reservoirs, when ormation of the hydrochemical and hydrobiologi-al regimes is occurring and a diversity of habitats being created, the variability of all indices of iochemical composition increases considerably. s the reservoirs age the variability of the indices ecreases. In the mussels there is a decrease in rotein and of the caloric value and an increase of ie ash content in comparison with these indices in ussels of the same species from the river.—Copy-ght 1976, Biological Abstracts, Inc.
'77-00281

ITERACTION BETWEEN AQUATIC PLANTS ND BED SEDIMENTS IN MERCURY UPTAKE ROM FLOWING WATER,
ational Research Council of Canada, Ottawa)ntario). Div. of Biological Sciences.
. C. Mortimer, and A. Kudo.
ie Journal of Environmental Quality, Vol. 4, No. p 491-495, October-December 1975. 6 fig, 7 tab, ef.

escriptors: *Mercury, *Aquatic environment, quatic life, *Aquatic plants, Aquatic soils, lottom sediments, *Canada, *Absorption.
entifiers: *Ottawa River(Ont), *Elodea densa, ercuric chloride, Methyl-mercuric chloride.

d sediment from a known zone in the Ottawa ver study area and cuttings of Elodea densa re set out in aquaria in a 24-day controlled, wing water experiment. Elodea was planted in diment and in glass beads, and sediment was ex-sed with and without plants, all in the same uaria for 7 days before the addition of mercury th 203 Hg. Three concentrations each of mercu-chloride and methyl mercuric chloride were ntinuously metered into the input water to yield uarium levels of 0.2, 2, and 10 micro-g/liter. ere was no significant difference in the uptake e between the two forms of mercury. Uptake s proportional to water concentration over the ire 17-day exposure period in both plants and diment. Methyl mercury was more toxic to plant wth in this time interval than inorganic mercu-(Skogerboe-Colo St)
7-00301

LITTORAL ZOOPLANKTON OF THE BAIKAL OPEN ZONE, (IN RUSSIAN),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 2H.
W77-00333

A RAPID METHOD FOR MEASURING THE ACUTE TOXICITY OF PULP MILL EFFLUENTS AND OTHER TOXICANTS TO SALMONID FISH AT AMBIENT ROOM TEMPERATURE,
B. C. Research Ltd., Vancouver.
D. J. McLeay.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 6, p 1303-1311, June, 1976. 6 tab, 24 ref.

Descriptors: *Pulp wastes, *Toxicity, *Salmonids, *Bioassay, Analytical techniques, Wastes, Industrial wastes, Water pollution sources, Water pollution effects, Lethal limit, Rainbow trout, Fish, Dissolved oxygen, Water pollution, Zinc, Phenols, Toxins, Pollutants, Chlorinated hydrocarbon pesticides.
Identifiers: Coho salmon(Oncorhynchus kisutch), Dehydroabietic acid, Lindane(Gamma-benzene hexachloride), Chlorine compounds, Resin acids.

A residual oxygen bioassay performed at ambient room temperature is examined as a rapid method for measuring the acute toxicity of pulp mill effluents and other toxicants to salmonid fish. Tests results are evaluated in comparison with 96-hr LC(50) bioassays. At test temperatures of 19-22 C and coho salmon (Oncorhynchus kisutch) loadings of 4-5 g/liter, residual oxygen levels were elevated in effluent concentrations equivalent to 0.5-0.9 of the samples' 96-hr LC(50) values; these tests were completed within 5-6.5 hr. Sensitivity increased only slightly with a loading of 1 g/liter and this test required 18 hr for completion. Decreasing the number of fish per jar from 4 to 1 while holding fish loadings constant by varying the size of the test containers did not alter the tests' sensitivity. Results indicate that, with a loading of 4-5 g fish/liter and 10 replicates of 1 fish/jar, a residual oxygen bioassay at ambient room temperature is more sensitive than a 96-hr LC(50) batch replacement bioassay (2 liters/g fish/day). Under these conditions fish requirements are identical; the residual oxygen test is completed within 6.5 hr and 32- to 40-fold reduction in volume of test solutions required is achieved. The procedure was evaluated with rainbow trout (Salmo gairdneri) using dehydroabietic acid, zinc, phenol, and lindane. Significant responses occurred with these toxicants at concentrations equivalent to 0.5-1.0 of the samples' 96-hr LC(50) values and higher. (Witt-IPC)
W77-00336

KLEBSIELLA DENSITIES IN WATERS RECEIVING WOOD PULP EFFLUENTS,
Environmental Protection Agency, Dauphine Island, Ala. Gulf Coast Water Supply Research Lab.
B. E. Huntley, A. C. Jones, and V. J. Cabelli.
Journal Water Pollution Control Federation, Vol. 48, No. 7, p 1766-1771, July, 1976. 1 fig, 3 tab, 17 ref.

Descriptors: Enteric bacteria, Aquatic bacteria, *Coliforms, *Pulp wastes, *Salmonella, *Alabama, *Water pollution sources, Wastes, Industrial wastes, Water pollution, E. coli, Bacteria, Aerobic bacteria, Water temperature, Hydrogen ion concentration, Public health, Microorganisms, Aquatic microorganisms, Effluents, *Path of pollutants, Bays.
Identifiers: *Enterobacter, *Klebsiella, *Mobile Bay(Ala), Garrows Bend(Ala).

The distribution of coliform biotypes and Salmonella species in waters below a pulp mill on Garrows Bend off the northwest tip of Mobile Bay, Alabama, was determined. The bacterial isolates were obtained from gauze traps and surface water grap samples. Water temperature and pH were monitored. Of the organisms isolated, 60% were identified as Klebsiella and 34% as Escherichia coli. The remaining 6% were primarily members of the genus Enterobacter. Only one Salmonella isolate was obtained, a group C Salmonella. The findings are discussed in terms of potential health effects and the interpretation of total and fecal coliform data from such waters. (Witt-IPC)
W77-00337

ON THE EUTROPHICATION IN THE LAKE CHANGJA, (IN KOREAN),
Seoul National Univ. (Republic of Korea). Dept. of Botany.
K. Lee, K. B. Uhm, and Y. M. Kwon.
Korean J Bot 18(3), p 135-138, 1975.

Descriptors: *Eutrophication, Lakes, Asia, Bacteria, Water pollution effects, Water temperature, Stratification, Dissolved oxygen, Phosphorus, Nitrogen, Chlorophyll, Coliforms.
Identifiers: *Lake Changja(Korea).

The process of eutrophication was studied in Lake Changja, Korea, from Nov. 1974-May 1975. Water temperature stratification occurred in April; the dissolved O2 content varied slightly; it was almost 0 beginning in Jan. Total P increased very rapidly in Feb.; total N and carbohydrate-like substances increased slightly. The amount of chlorophyll-alpha varied from 127-717 mg/m2 with maximum value in Jan.; chlorophyll-alpha and total P related to each other. The numbers of coliform bacteria at point A were 10 times greater than at point B. Lake Changja is very eutrophic; its ecological equilibrium cannot be recovered until the origin of pollution is eliminated.—Copyright 1976, Biological Abstracts, Inc.
W77-00344

THE EFFECT OF SURFACE-ACTIVE SUBSTANCES ON PATHOGENIC ENTEROBACTERIA IN WATER, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (II) (USSR).
V. V. Shelakova.
Gig Sanit 3, p 25-28, 1975.

Descriptors: *Pathogenic bacteria, Bacteria, *Ions, *Salmonella, Inhibition, Cations, Anions, Water pollution effects.
Identifiers: *Salmonella-typhimurium, *Surface-active substances, LD50.

The anion-active and nonionogenic surface-active substances (SAS) at concentrations of 10-20 mg/l can stimulate Salmonella multiplication. The cation-active SAS when present at high concentrations inhibit Salmonella multiplication. In case of simultaneous entry into the body of SAS and the infectious agent (S. typhimurium) the value of its LD50 diminished and its virulence increased. Contamination of water bodies with SAS may deteriorate their sanitary-epidemic situation.—Copyright 1976, Biological Abstracts, Inc.
W77-00346

THE BEHAVIOR OF PSEUDOMONAS AERUGINOSA IN SURFACE WATER, COOLING WATER AND WASTE WATER, (IN GERMAN),
Bonn Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 5B.
W77-00347

POSSIBILITIES OF DETERMINING COMMUNITY BOUNDARIES WITHIN THE LIMITS OF A LAKE ECOSYSTEM, (IN RUSSIAN),
Nature Conservation, Game Preserves and Hunting, Moscow (USSR). Central Lab.
For primary bibliographic entry see Field 2H.
W77-00367

ENVIRONMENTAL IMPACT OF STREAM CHANNELIZATION,
Baker (Michael), Jr., Inc., Beaver, Pa.
For primary bibliographic entry see Field 6G.
W77-00375

GEOGRAPHICAL AND SEASONAL VARIABILITY OF MARINE PLANKTON.
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
Available from the National Technical Information Service, Springfield, VA 22161 as TT-74-50030, Price codes: A14 in paper copy, A01 in microfiche. TT-74-50030, 1975. Translated from Izdatelstvo 'Nauka,' Leningradskoe Otdelente, Leningrad, 1972. B. E. Bykhovskii, editor. 309 p.

Descriptors: *Ecological distribution, *Marine microorganisms, *Oceans, *Zooplankton, Systematics, Speciation, Phylogeny, Evolution, Copepods, Latitudinal studies, Ecotypes.
Identifiers: Morphogenesis, Calanidae, Oithonidae.

Because of vast protein resources in the world oceans investigations conducted by the Laboratory of Marine Research attached to the Zoological Institute of the USSR Academy of Sciences are presented. They relate to planktonic ecology, systematics, speciation, morphogenesis, phylogeny, and microevolution. Results of variation statistics and comparative functional-morphological studies of copepod populations collected by Soviet expeditions to different oceans are presented. A new classification for the family Calanidae based on phylogenetic relationships and closely related to oceanic zoogeographic zones was developed. The polymorphic species Calanus plumchrus in the North Pacific has three independent forms with their own geographical range. Some species of the family Oithonidae display a complex geographical variability. Morphological details of the genus Calanus mouth apparatus are described; changes occurred depending on diatom or dinoflagellate predominance in crustacean food, which is a function of latitudinal zonation. Studies of seasonal shifts, distribution, and ecology of planktonic complexes in little explored parts of the ocean and Antarctica coastal waters are reported. The articles cover a cross-section of the main trends in plankton research being done at the Academy's Department for Plankton and Lower Crustacea to clarify the qualitative composition of oceanic plankton. (See W77-00394 thru W77-00401) (Buchanan-Davidson--Wisconsin)
W77-00393

PHYLOGENY OF THE FAMILY CALANIDAE(COPEPODA) ON THE BASIS OF A COMPARATIVE MORPHOLOGICAL ANALYSIS OF ITS CHARACTERS,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
K. A. Brodskii.
In: Geographic and Seasonal Variability of Marine Plankton, TT-74-50030, 1975. Translated from Izdatelstvo 'Nauka,'Leningradskoe Otdelente, Leningrad, 1972. B. E. Bykhovskii, editor, p. 1-127. 123 fit., 21 tab., 34 ref. 27 ref.

Descriptors: *Marine microorganisms, *Phylogeny, *Copepods, *Systematics, Speciation, Ecological distribution, Environmental effects, Latitudinal studies, Spatial distribution, Oceans, Fish food organisms, Zooplankton.
Identifiers: *Calanus, Calanus macrocarinatus, Undinula, Calanoides, Neocalanus, Nannocalanus, Canthocalanus.

The systematics of the family Calanidae (Copepoda) of all known species in the world oceans are examined and classified according to the following characters: Female genitalia, fifth pair of male or female limbs, body length, antennule length, cephalothorax form, last thoracic segment form, structure of first pair of female limbs, and special formations (morphological peculiarities of the swimming feet of different species). Parameters of the species Undinula related to length of the body and the antennules, number of setae, etc., were not considered. Species of genus Calanus were considered valid and the subgenera analyzed. Certain morphological features such as length and form of the body and armature of first and fifth pairs of limbs depend on ecological conditions related to latitudinal zones. A phylogenetic scheme is established for the family according to chronological and spatial principles. Relationships were found between variations in certain of these parameters in individuals of species of the genus Calanus and related genera and the ecogeographic conditions of latitutinal oceanic zones. Degrees of primitiveness or specialization were assessed on the basis of these relationships. A key to species is given. A new species, Calunus (Carinocalanus) macrocarinatus, is described. (See also W77-00393) (Buchanan-Davidson--Wisconsin)
W77-00394

ZOOPLANKTON OF DIKSON BAY (KARA SEA),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
L. L. Chistenko.
In: Geographical and Seasonal Variability of Marine Plankton, TT-74-50030, 1975. Translated from Izdatelstvo 'Nauka,' Leningradskoe Otdelente, Leningrad, 1972. B. E. Bukhovskii, editor, p. 263-274. 3 fig., 3 tab., 10 ref.

Descriptors: *Marine microorganisms, *Zooplankton, *Temporal distribution, *Arctic Ocean, Varieties, Annelids, Dominant organisms, Biological communities, Biomass, Copepods, Mollusks, Crustaceans. *Bays.
Identifiers: *Dikson Bay(USSR), *Kara Sea.

Seasonal changes in zooplankton were studied in the high Arctic area of Dikson Bay (Kara Sea) in 1955-1957. In the 48 zooplankton forms found, 28 species were determined--twenty species were marine, five species brackish-water, and three species freshwater forms. The marine forms were largely neritic coldwater Arctic species, but oceanic species were fairly abundant in the plankton. The brackish-water forms were autochthonous to the brackish Arctic waters; three were endemic to the high Arctic. Freshwater organisms were qualitatively and quantitatively small. The average biomass was 121 mg/cu m. The percentage composition of the average biomass was Copepoda 55.8% (Calanoids 53.5%), Chaetognatha 18.6%, Mollusca 13.3%, higher Crustacea 4.2%, Polychaeta 3.3%, Hydromedusae 1.9%, and other organisms 2.9%. Of the total zooplankton biomass, Sagitta accounted for 18.6%, Limnocalanus grimaldii, 17.4%, Calanus galacialis 13.7%, Pseudocalanus elongatus 7%,and Drepanopus bungei 7%. A springtime state of plankton was observed before onset of the thaw when the water was still frozen. There was no partial resumption of springtime processes during fall homothermy. Extremely variable hydrologic conditions in this area complicated the pattern of seasonal biological processes. (See also W77-00393) (Buchanan-Davidson--Wisconsin)
W77-00395

STRUCTURE OF THE MANDIBLES IN THE GENUS CALANUS S.L. IN RELATION TO LATITUDINAL ZONALITY,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
N. V. Vyshkvartseva.
In: Geographic and Seasonal Variability of Marine Plankton, TT-74-50030, 1975. Translated from Izdatelstvo 'Nauka,' Leningradskoe Otdelente, Leningrad, 1972. B. E. Bykhovskii, editor, p. 186-199. 9 fig., 1 tab., 20 ref. 46 ref.

Descriptors: *Marine microorganisms, *Copepods, *Phylogeny, *Latitudinal studies, *Diets, Oceans, Climatic zones, Ecotypes, Systematics, Crustaceans, Fish food organisms, Distribution.
Identifiers: *Calanus, Mandibles.

To determine the presence, degree, and causes o differentiation of mouth parts of a single genus twelve Calanus species were collected fro oceans. The masticatory edge of the mandible wa examined in each specimen. All species showe asymmetry of form of teeth C-1 and C-2 on bot mandibles and of the masticatory edge width. Ve tral teeth varied in Calanus species collected in di ferent zoogeographic regions. Species from hig latitudes in northern and southern hemisphere had two ventral teeth, V-1 and V-2. In specie from northern and southern temperate region tooth V-2 was only slightly developed or absen but there was a cuticular tubercle at the base o tooth V-1. Species from tropical regions had a si gle tooth, V-1. Ventral tooth differences were co related with differences in dietary composition i different regions. The food consumed was mostl diatoms in higher latitudes, but the proportion o flagellates in phytoplankton and consequently i crustacean diets increased toward the tropics. A the species level, there was a relationship betwee characteristic features of the range and compos tion of ventral teeth. Morphological specializatio of mandibles in this genus was accompanied b oligomerization of teeth numbers, but this proce was apparently not complete in some species. (Se also W77-00393) (Buchanan-Davidson--Wisco sin)
W77-00396

SEASONAL CHANGES OF ANTARCTI PLANKTON IN THE MOLODEZHAYA AN MIRNY REGION,
Akademiya Nauk SSSR, Leningrad. Zoologi neskii Institut.
A. Zvereva.
In: Geographical and Seasonal Variability Marine Plankton, TT-74-50030, 1975. Translate from Izdatelstvo 'Nauka,' Leningradskoe Otd lente, Leningrad, 1972. B. E. Bukhovskii, edito p. 248-262. 6 fig., 5 tab., 4 ref. 7 ref.

Descriptors: *Marine microorganisms, *Tempor distribution, *Antarctic Ocean, *Copepod Zooplankton, Dominant organisms, Period growth, Varieties.
Identifiers: *Mirny Station(Antarctic Ocean *Molodezhnaya Station (Antaractic Ocean).

Seasonal changes in Antarctic plankton were st died in samples collected at the Soviet stations Mirny and Molodezhnaya in 1958 and 1965-196 Hydrological data and species of copepods fou were recorded. In both areas, the most comm species found were Oithona similis, Ctenocalan vanus, Oncaea curvata, Calanoides acutu Calanus propinquus, Stephus longipes, Metrid lucens, and M. gerlachei in decreasing numbe Other species occurred irregularly in small nu bers. Immature forms were found in January, a males and females appeared in February-Marc In September there wasan increase in speci diversity and mature individuals. Immatu specimens of some species were absent in O tober, but in some species both immature and m ture forms were always present. The Molodez naya plankton was richer in species than the Mir plankton in which Microcalanus pygmae Racovitzanus antarcticus, Scaphocalan brevicornis, and Paralabidocera antarctica we not found. There were peaks of species diversi in January-February and September-October. T September-October peak contained male, fema and copepodid stages IV-V of most species. The was an increase in the volume of plankton/u water volume in January. The copopod spec found at these stations are listed and their matu ty, sexual and temporal distribution indicate (See also W77-00393) (Buchanan-Davis Wisconsin).
W77-00397

OLOGICAL SEASONS IN THE ZOOPLANK-ON OF DAVIS STRAIT,
kademiya Nauk SSSR, Leningrad. ologicheskii Institut.
A. Pavshtiks.
: Geographical and Seasonal Variability of arine Plankton, TT-74-50030, 1975. Translated m Izdatelstvo 'Nauka,' Leningradskoe Otde-ite, Leningrad, 1972. B. E. Bykhovskii, editor, 200-247. 15 fig., 12 tab., 33 ref. 24 ref.

escriptors: *Marine microorganisms, *Seasonal, opepods, *Biomass, Zooplankton, Biological mmunities, *Atlantic Ocean, Arctic Ocean, ean currents, Varieties, Fish food organisms, fe cycles, Spawning, Distribution, Canada.
entifiers: *Davis Strait(North Atlantic Ocean), ninger current, Calanus finmarchicus, Calanus cialis.

oplankton samples were collected from the vis Strait bordering Canada's Baffin Island and eenland, in 1962-1964. In terms of abundance d biomass, Calanus finmarchicus, C. hyper-reus, Metridia longa, Pareuchaeta norvegica, thona similis, Oncaea borealis, Thysanoessa gicaudata, Limacina retroverse, and L. helicina re predominant. About 100 other species oc-rred less frequently and did not appreciably af-ct seasonal changes in total abundance and mass. Sometimes Aglantha digitale, enophora, larvae of benthic animals, etc. edominated. The continuous presence of C. fin-archicus and Oithona similis indicated the boreal ture of the fauna. Atlantic waters reach the vis Strait in the Irminger Current which is in-bited by C. finmarchicus and Pareuchaeta nor-gica juveniles. Arctic water indicators were C. perboreus, Metridia longa, and Limacina licina. Water temperature fluctuations in-enced abundance, biomass, and zooplankton velopment schedules. Biological seasons started different times and were of different durations parts of the strait influenced by different water sses. Ice often interfered with spring spawning ocesses. The biological season affected plank-ic population size more than species composi-n. Planktonic abundances increased with onset biological spring and remained relatively changed until fall, but relative numbers and mass of some zooplankton varied. Davis Strait oplankton showed similarities to fauna of other rthern waters influenced by the North Atlantic rrent. (See also W77-00393) (Buchanan-David-n--Wisconsin)
77-00398

ECIES COMPOSITION AND DISTRIBUTION ECOLOGICAL COMPLEXES OF OPLANKTON IN THE ENISEI GULF,
ademiya Nauk SSSR, Leningrad. ologicheskii Institut.
L. Chislenko.
Geographical and Seasonal Variability of rine Plankton, TT-74-50030, 1975. Translated m Izdatelstvo 'Nauka,' Leningradskoe Otde-te, Leningrad, 1972. B. E. Bukhovskii, editor, 75-301. 21 fig., 7 tab., 18 ref.

scriptors: *Marine microorganisms, * Ecologi-distribution, *Temporal distribution, oplankton, Hydrologic properties, Dominant anisms, Biological communities, Saline-fresh-er interfaces, Gulfs, Arctic, Biomass.
ntifiers: *Enisei Gulf(Kara Sea).

: ecology and distribution of zooplankton in the sei Gulf on the Kara Sea were studied during 5-1956. Synchronous hydrological determina-ıs were also made. Among the 84 forms found, species were identified: 23 marine species, 7 ckish-water species, and 40 freshwater species. h form is described and its life stage and onse to temperature and salinity recorded. h zooplankton complex may predominate for a ain time and may be separated from the others ically and horizontally. The marine complex consisted mostly of neritic coldwater Arctic species. The Enisei Gulf also contained some oceanic species, especially in the winter. The brackish-water forms were all autochthonous to the brackish Arctic waters; four were endemic to the high Arctic. The freshwater fauna were richest in species but its biomass was much smaller than that of the brackish complex and its existence in the gulf shorter than that of the marine complex. The brackish-water complex was the least diverse qualitatively but predominated quantitatively due to its adaptation to environmental conditions. Zooplankton distribution and development depend largely on hydrologic conditions which vary seasonally and annually. The Enisei Gulf is a typical monocylic polar water body. The biological fall season is not expressed in the zooplankton. (See also W77-00393) (Buchanan-Davidson--Wisconsin).
W77-00399

GEOGRAPHICAL VARIABILITY OF SOME SPECIES OF THE FAMILY OITHONIDAE (COPEPODA, CYCLOPOIDA),
Akademiya Nauk SSSR, Leningrad. Zoologic-neskii Institut.
V. S. Shuvalov.
In: Geographic and Seasonal Variability of Marine Plankton, TT-74-50030, 1975. Translated from Izdatelstvo 'Nauka,' Leningradskoe Otdelente, Leningrad, 1972. B. E. Bykhovskii, editor, p. 169-186. 9 fig., 1 tab., 15 ref. 46 ref.

Descriptors: *Marine microorganisms, *Geographic regions, *Copepods, *Ecological distribution, *Phylogeny, Oceans, Zooplankton, Ocean currents, Variability, Atlantic Ocean, Arctic Ocean, Tropical regions, Temperate, Ecotypes.
Identifiers: *Oithona similis, Oithona atlantica, Oithona plumifera, White Sea, Sea of Okhotsk, Mediterranean Sea, Gulf of Mexico.

Planktonic organisms can serve as biological indicators of hydrological regimes, water masses, currents, and zoogeographic regions. Variations in body size and morphological characters were measured in Oithona similis, 0. atlantica, and 0. plumifera collected from different oceans. Two sizes of 0. similis were distinguished--a small Atlantic-White Sea group and a large Arctic-Sea of Okhotsk group. Configurations of the rostrum and cephalothorax varied, but not the limbs or armature. Vertical and horizontal size variations occurred due to Artic water inflow. 0. similis lives under a wide range of conditions but is composed of infraspecific forms and groups, each confined to a relatively limited range of factors. 0. plumifera and 0. atlantica were closely related but independent. 0. atlantica was a boreal species inhabiting the North Atlantic, Mediterranean, and northern Gulf of Mexico temperate zones, while 0. plumifera was a tropical species. 0. atlantica size and antennule length gradually decreased from north to south in the northern hemisphere; this was reversed in the southern hemisphere. 0. plumifera varied in hairiness and length of setae on basipodites of the swimming feet, antennules, and furcal rami. Diversity of environmental conditions can cause development of adaptive features in plankton. (See also W77-00393) (Buchanan-Davidson--Wisconsin)
W77-00400

INTRASPECIFIC DIFFERENTIATION OF CALANUS PLUMCHRUS MARUKAWA,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
M. S. Kos.
In: Geographic and Seasonal Variability of Marine Plankton, TT-74-50030, 1975. Translated from Izdatelstvo 'Nauka,' Leningradskoe Otdelente, Leningrad, 1972. B. E. Bykhovskii, editor, p. 128-168. 28 fig., 5 tab., 63 ref. 46 ref.

Descriptors: *Marine microorganisms, *Speciation, *Phylogeny, *Copepods, Ecological distribution, Oceans, *Pacific Ocean, Animal populations, Systematics, Geographical regions, Seasonal, Ocean currents, Zooplankton, Ecotypes.
Identifiers: *Calanus plumchrus, USSR.

Calanus plumchrus is one of the most abundant and widespread species of copepods in the North Pacific Ocean and the Eastern seas of the USSR. Population analyses were made of over a 1000 specimens from different parts of its range. Twenty-two characters (morphological characteristics, measurements of body parts, etc.) were studied for each specimen. Comparative analysis showed that these characters varied in populations from geographically remote regions but not seasonally in a given region. Significant differences were observed between many of the characters concerning morphological features of females and, to a lesser extent, males. Comparative morphological analysis of intraspecific variability demonstrated the polymorphism of this species. Intraspecific categories could be detected only in sexually mature forms. The northwestern population was a specific form distinct from the northeastern and northern forms; it had a defined range, and the male, and especially the female, had characteristic structural features. Overlapping of intermediate forms in these ranges never exceeded 25%. Intraspecific differentiation depended mainly on geographic distance, while differences in currents and water mass distribution played smaller roles. The comparatively weak expression of intraspecific differentiation in C. plumchrus was attributed to the relative homogeneity of the hydrological conditions in the North Pacific. (See also W77-00393) (Buchanan-Davidson--Wisconsin).
W77-00401

PROXIMATE NUTRITIVE VALUE CHANGES DURING DECOMPOSITION OF SALT MARSH PLANTS,
Mississippi State Univ., Mississippi State.
A. A. de la. Cruz.
Hydrobiologia, Vol. 47, No. 3-4, p. 475-480, 1975. 2 tab., 10 ref. NOAA-SG 2-35362, NSF GA-35715.

Descriptors: *Halophytes, *Tidal marshes, *Productivity, Degradation(Decomposition), Detritus, Proteins, Carbohydrates, *Decomposing organic matter, Bulrushes, Mississippi, Fibers(Plant), Lipids, Salt marshes.
Identifiers: Giant cordgrass, Salt grass.

Caloric and nutritive values were determined for giant cordgrass (Spartina cynosuroides), salt grass (Distichlis spicata), and bulrush (Scirpus americanus), which are the dominate vascular plants in Mississippi coastal tidal marshes, during their decomposition to particulate detritus. Decomposition of materials enclosed in nylon-mesh bags occurred faster when submerged. The combustible organic content (ash-free dry weight) of live young plants was lower than that of adult plants; ash-free values of detritus were 63-72% of live plant values. Caloric values of detritus increased slightly. Crude fiber, carbohydrate, and fat contents declined in the detritus. Protein increased in detritus by asmuch as 96% in Scirpus, 99% in Spartina, and 300% in Distichlis. Marsh plant detritus is a nutritional source of food for estuarine consumers and may be even nutritionally higher than live plants, since they contain less indigestible crude fiber and cellulose. Absorption and/or adsorption of dissolved nutrients to decaying plant matter enhances retention of relatively high organic concentrations, leading to protein and energy retention or increase in the particulate detritus. (Buchanan-Davidson--Wisconsin).
W77-00402

EFFECT OF THE DISCHARGE WATERS OF THE TRIPOL'E THERMAL ELECTRIC STA-

TION OF THE THERMAL REGIME OF THE DNIEPER, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Instytut Hidrobiologii.
N. V. Pikush.
Gidrobiol Zh. 11(1), p 79-81, 1975.

Descriptors: Rivers, *Thermal powerplants, *Thermal pollution, Heated water, Water pollution sources, Effluents, Mixing, Regime, Cooling water.
Identifiers: *Dnieper River, Electric, *USSR, Waters.

Ten hydrothermal surveys were carried out in 1970-1972 on the Dnieper River (USSR) from 3 km above the Tripol'e thermal electric station to 120 km downstream from it. During the 1st 3 yr of operation the average daily discharge of heated waters varid from 8.3-53.4 m3/s and the discharge in the Dnieper varied within 500-18,400 m3/s. As a consequence of this variation mixing and cooling occurred at different distances from the discharge point.--Copyright 1976, Biological Abstracts, Inc.
W77-00408

THE EFFECT OF HUMANS ON BIOGEOCENOSES AND ENVIRONMENTAL PROTECTION, (IN RUSSIAN),
For primary bibliographic entry see Field 6G.
W77-00412

LARVAL POPULATIONS OF CHIRONOMIDAE IN THE PERIPHYTON OF THE YUGOSLAV PART OF THE DANUBE BETWEEN BIOGRAD AND TEKIJA, (IN GERMAN),
Institute for Biological Research, Belgrade (Yugoslavia).
M. Jankovic.
Arch Hydrobiol Supplementb. 44(4), p 515-524, 1975.

Descriptors: *Diptera, Aquatic populations, *Larvae, *Periphyton, Europe, Rivers.
Identifiers: *Cricotopus-Silvestris, *Danube River, *Polypedilum-Convictum, Tekija, *Yugoslavia, Biograd.

In the periphyton 25 spp. or forms of Chironomidae were recorded, but the basic species complex consists of only 9 spp. The most frequent species is Cricotopus silvestris and the leading species in production is Polypedilum gr. convictum.--Copyright 1976, Biological Abstracts, Inc.
W77-00413

CHANGES IN THE CHIRONOMID FAUNA CAUSED BY DAMMING THE DANUBE, (IN GERMAN),
Institute for Biological Research, Belgrade (Yugoslavia).
M. Jankovic.
Arch Hydrobiol Supplementb. 44(4), p 462-479, 1975.

Descriptors: *Sampling, *Reservoirs, Aquatic fauna, Population, *Plant populations, *Diptera, *Post-impoundment.
Identifiers: Chironomus-plumosus, Chironomus-thummi-F-fluviatilis, Crypto-chironomus, *Danube River, *Yugoslavia.

Out of 29 spp. that occurred in the Danube, only 15 were found in the Djerdap Reservoir (Yugoslavia). The rheophilous forms disappeared first, primarily the scarce psammorhe-ophilous species from the genus Cryptochironomus and later the more abundant psammo- and lithortheophilous species. Most Chironomidae are lacustrine and mainly pelophilous species. Intensive development of Chironomus f. l. plumosus was observed. In contrast, C.f.l. thummi f. fluviatilis decreases gradually in number parallel to the diminishing flow in the basin.--Copyright 1976, Biological Abstracts, Inc.
W77-00414

COMPARATIVE STUDIES ON THE ACTION OF CHLORINE AND OZONE ON POLIOVIRUSES IN THE REPROCESSING OF DRINKING WATER IN ESSEN, (IN GERMAN),
Essen Univ. (Gesamthochschule) (West Germany). Abteilung fuer Medizinische Virologie und Immunologie.
For primary bibliographic entry see Field 5F.
W77-00419

THE NUTRIENTS AND PLANTS OF LAKE JOONDALUP, A MILDLY EUTROPHIC LAKE EXPERIENCING LARGE SEASONAL CHANGES IN VOLUME,
Western Australia Univ., Nedlands. Dept. of Botany.
R. A. Congdon, and A. J. McComb.
Journal of the Royal Society of Western Australia, Vol 59 Part 1, p 14-23, May 1976. 11 fig, 3 tab, 24 ref.

Descriptors: *Lakes, *Lake shores, *Eutrophication, *Baseline studies, *Algae, Urbanization, Water chemistry, Aquatic productivity, Primary productivity, Trophic level, *Nutrients, Nitrogen, Phosphorus, Seasonal, Vegetation, *Australia, Aquatic plants, Water pollution effects.
Identifiers: *Lake Joondalup(W.A.).

Lake Joondalup is one of a chain of lakes to the north of Perth, Western Australia, in a calcareous stable dune system 6 km from the ocean. The region is subject to rapid urbanization and development. A study was undertaken to record the seasonal fluctuations in nutrients and algal density of the lake, with a description of the fringing vegetation, to provide a reference against which future changes may be assessed. Cation ratios in the lake resemble seawater apart from relatively high calcium; seasonal changes in water volume greatly affect ionic concentration. A bloom of the green alga Dispora coincides with low volume and high ion levels. Total nitrogen is high compared to phosphorus, and the data give indications that phosphorus levels may limit algal productivity in the lake. (CSIRO)
W77-00442

YELLOW SUBSTANCE (GELBSTOFF) AND ITS CONTRIBUTION TO THE ATTENUATION OF PHOTOSYNTHETICALLY ACTIVE RADIATION IN SOME INLAND AND COASTAL SOUTH-EASTERN AUSTRALIAN WATERS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. T. O. Kirk.
Australian Journal of Marine and Freshwater Research, Vol. 27, No. 1, p 61-71, March 1976. 4 fig, 3 tab, 17 ref.

Descriptors: *Pigments, *Light penetration, *Photosynthesis, Aquatic environment, *Australia, Freshwater, Sea water, Light quality, Lakes, Reservoirs, Bays, Rivers, Water pollution effects.
Identifiers: Lake Ginninderra(A.C.T.), Lake Burley Griffin(A.C.T.), Lake George(N.S.W.), Cotter Dam(A.C.T.), Burrinjuck Dam(N.S.W.), Clyde River(N.S.W.), Bateman's Bay(N.S.W.), *Gelbstoff.

The absorption spectra relative to distilled water of samples from various inland and coastal waters in south-eastern Australia (lake, reservoir, river and bay) have been measured. Amongst the freshwater samples the level of dissolved yellow substance (gelbstoff) was found to vary seven-fold; in coastal water the concentration was much lower than in any of the freshwater samples. In the inland waters yellow substance has a dominating influence on light penetration, and the blue region of the spectrum is abolished at quite moderat depths. In all cases except seawater it was calcu lated that most of the quanta captured are ab sorbed by yellow substance rather than by wate An alternative name, gilvin, is suggested for th yellow pigments in natural waters. (CSIRO)
W77-00448

NUTRIENT STATUS OF THE SEDIMENTS I LAKE MULWALA. I. TOTAL PHOSPHORUS,
Caulfield Inst. of Tech. (Australia). Dept Chemistry.
B. T. Hart, R. J. McGregor, and W. S. Perriman.
Australian Journal of Marine and Freshwat Research, Vol 27, No. 1, p 129 - 135, March 1976. fig., 3 tab., 18 ref.

Descriptors: *Phosphorus, *Lake sedimen *Australia, *Nutrients, Lakes, Urbanizatio Eutrophication, Water pollution effects.
Identifiers: Lake Mulwala(N.S.W.-Vic.).

Chemical analyses are reported for sediment sa ples taken from Lake Mulwala, a man-made la in the River Murray (Australia), downstream fr a proposed area of urban growth. The sedimen are non-calcareous and high in clay content. To phosphorus levels were found to be of the sa order of magnitude as values reported f eutrophic lakes in other countries. Statistical an ysis of the data has allowed the calculation o predictive model for total phosphorus levels in t lake sediments. Total phosphorus was found to influenced by location within the lake, orga content of the sediments and water depth. On t basis of total phosphorus levels, the lake can be vided into two regions - an upper region influenc by the two input rivers, which has lower levels total phosphorus, and a lower region with hig levels of sediment phosphorus. It appears t about 50% of this total phosphorus is potentia available for exchange with the water colun (CSIRO)
W77-00450

NUTRIENT ECONOMIES AND TROPH STATUS OF LAKES SORELL AND CRESCEN TASMANIA (AUSTRALIA),
Tasmania Univ., Hobart (Australia). Dept. Botany.
D. M. H. Cheng, and P. A. Tyler.
Australian Journal of Marine and Freshwa Research, Vol 27, No 1, p 151-163, March 197 fig, 7 tab, 15 ref.

Descriptors: *Nutrients, *Lakes, *Austra *Tripton, *Eutrophication, Algae, Phytoplankt Primary productivity, Nitrogen, Phosphorus, icates, Carbonates, Trace elements, Watersh management, Recreation, *Trophic level, Wa pollution effects.
Identifiers: Lake Sorell(Tas), Lake Crescent(Ta Tasmania.

Lakes Sorell and Crescent are shallow, polyu tic, connected lakes with fundamentally sim physicochemical limnology, but markedly c trasting algal populations and phytoplank biomass. Investigations are described wh sought an explanation in terms of nutrient eco mies for the biotic contrast. The effects of nutri enrichment with nitrogen, phosphorus, carbon silicate, trace elements and chelates, and of trip removal, on Carbon-14 uptake in incubated s ples were determined. It is concluded that greater productivity and greater plankton biom of Lake Crescent rests on its greater tripton lo derived from greater scouring of sediments, flow through from Lake Sorell and an abund fringing marshland. It is likely that the distinc floras of the two lakes are adapted to the diffe nutrient conditions, so that flow-through inoc of Lake Sorell algae cannot become establishe Lake Crescent. As the lakes are alre mesotrophic and eutrophic respectively, mana ment plans for this recreational area should see limit nutrient inputs. (CSIRO)

W77-00451

HYGIENIC ASPECTS OF MICROBIAL CONTAMINATION OF WATER BASINS, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W77-00454

IDENTIFICATION OF TWO CHLORINATED GUAIACOLS IN KRAFT BLEACHING WASTEWATERS,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5A.
W77-00459

NATIONAL CONFERENCE ON POLYCHLORINATED BIPHENYLS (NOVEMBER 19-21, 1975, CHICAGO, ILLINOIS), PROCEEDINGS.
Environmental Protection Agency, Washington, D. C. Office of Toxic Substances.
For primary bibliographic entry see Field 5B.
W77-00460

CONSUMPTION OF ORGANIC MATTER OF MUDS BY ILYOCRYPTUS SORDIDUS (CLADOCERA, MACROTHRICIDAE), (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
Z. N. Chirkova, and V. I. Romanenko.
Gidrobiol Zh. 9(5), p 63-67, 1973.

Descriptors: *Reservoirs, *Bottom sediments, Feeding rates, *Biomass, *Organic matter, Sands, Mud, Silts, *Crustaceans, Lake sediments.
Identifiers: *Ilyocryptus-Sordidus, Macrothricidae, USSR, Rybinsk reservoir, Volga.

Aquarium experiments with Ilyocryptus sordidus on gray, peaty and sandy muds and pure sand collected from various places of the Rybinsk reservoir on the Volga (USSR) showed that the nonuniform distribution of the cladoceran in the reservoir is due to the food value of the bottom deposits. The main factor limiting the distribution of I. sordidus in the reservoir is the weak silting of the flooded soils and the low content of organic matter on the slightly silted areas. When calculating the intensity of feeding and biomass production of Ilyocryptus, (as much as 99% of the total number of cladocerans of the family Macrothricidae), it is necessary to consider the character of the bottom deposits and their organic matter content.--Copyright 1975, Biological Abstracts, Inc.
W77-00507

POTAMOGETON PERFOLIATUS IN A BRACKISH-WATER ESTUARY AT ORA, FREDRIKSTAD (S. NORWAY), (IN NORWEGIAN),
Norsk Institutt for Vannforskning, Blindern.
B. Rorslett.
Blyttia. 33(2), p 69-82, 1975.

Descriptors: *Estuaries, Salinity, Vegetation, *Brackish water, Analysis, Remote sensing, Europe, Water pollution effects.
Identifiers: *Fauna, *Flora, Fredrikstad, *Norway(Ora Estuary), *Potamogeton Perfoliatus, Ruppia.

The River Glama estuary at Fredrikstad, S Norway has a rich flora and fauna. The brackish-water area contains a mixture of marine and freshwater species. A municipal land-reclamation project carried out about 1970 has markedly influenced the salinity of the Ora estuary. A general increase in the salinity level has led to vegetational changes. The submergent freshwater species P. perfoliatus, formerly abundant in the estuary, is rapidly disappearing, being replaced by the salinity-tolerant Ruppia. Remote sensing imagery acquired by IR falsecolor films and multispectral camera was used to map the present distribution of P. perfoliatus in the estuarine region. The colony pattern and development could be analyzed on the imagery. A gradual breakdown of the Potamogeton population by increasing salinity was demonstrated. In laboratory experiments, the salinity tolerance of P. perfoliatus was lower than 90%. Salinity values exceeding the tolerance level of P. perfoliatus are now frequently found in the estuarine waters.–Copyright 1975, Biological Abstracts, Inc.
W77-00508

SEASONAL SUCCESSION AND VERTICAL DISTRIBUTION OF PHYTOPLANKTON IN LAKE HAYES AND LAKE JOHNSON, SOUTH ISLAND, NEW ZEALAND,
Otago Univ., Dunedin (New Zealand). Dept. of Zoology.
Carolyn W. Burns, and S. F. Mitchell.
N Z J Mar Freshwater Res. 8(1), p 167-209, 1974.

Descriptors: *Lakes, *Australia, Algae, *Phytoplankton, Plankton, Diatoms, Chlorophyta, *Plant populations, Eutrophication, Water pollution effects.
Identifiers: Anabaena-flos-aquae, Closterium-aciculare, Clostrium-acutum-var-variabile, Cryptomonas, Cyclotella-kuetzingiana, Hayes Lake, Melosira-granulata, *New Zealand, Peridinium-cinctum, Staurastrum-bibrachiatum, Staurastrum-Spp.

In 2 small monomictic lakes near Queenstown, South Island, New Zealand, algal associations characteristic of eutrophic waters were present throughout most of the period from Dec. 1969-Feb. 1972. Melosira granulata dominated the plankton in winter; at other times of the year Closterium aciculare, Cyclotella kuetzingiana, and Staurastrum spp. were dominant. In Lake Johnson, the major algae differed from 1 yr to another. Blooms of A. flos-aquae formed during the 1st two summers but were absent in the third, when Closterium acutum var. variabile was dominant. Peridinium cinctum was abundant throughout the 1st yr, especially in December 1969 and October 1970, when concentrations of more than 1000 cells/ml occurred at the surface. During autumn and winter of the 2nd yr, S. bibrachiatum dominated the plankton. In both lakes, micro-algae were abundant in late spring and early summer. In winter, when the lakes were isothermal, algae were distributed fairly uniformly with depth. During the period of thermal stratification, algae were mainly confined to the epilimnion. Although green algae and diatoms were usually dispersed fairly uniformly throughout this zone, Cryptomonas and Peridinium were often concentrated at a certain depth. In Lake Johnson in late summer 1971, a layer of purple phytosynthetic bacteria, of which concentrations of 0.5-1.3 x 106 cells/ml were recorded, was present at a depth of 7-8 m. The mean standing crop of algae for the trophogenic zone of Lake Hayes was 6000 cells/ml, and a maximum crop of 65,000 cells/ml was recorded in December 1971 during an Anabaena bloom: the mean volume of phytoplankton was 1.93 mm3 per litre for the trophogenic zone with a maximum of 7.49 mm3/l in Jan. 1970 when Anabaena and Peridinium were abundant. In Lake Johnson, the mean number of algae in the trophogenic zone was 11,000 cells/ml and the mean volume of phytoplankton was 9.37 mm3/l: a maximum volume of 33.12 mm3/l was recorded in Oct. 1970 when Peridinium was abundant. Copyright 1975, Biological Abstracts, Inc.
W77-00517

5D. Waste Treatment Processes

THE EFFECTS OF VARIOUS TERTIARY TREATMENT NUTRIENT REMOVAL SCHEMES ON PERIPHYTON COMMUNITIES IN MODEL LABORATORY STREAMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-00005

PROCEEDINGS OF THE 1975 NATIONAL CONFERENCE ON MUNICIPAL SLUDGE MANAGEMENT AND DISPOSAL.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
August 18-20, 1975, Held at Anaheim, California, 257 p. Published in 1975 by Information Transfer, Inc., Rockville, Md.

Descriptors: *Waste water treatment, *Pollutant identification, *Treatment facilities, *Conferences, *Municipal wastes, *Sludge disposal, *Sludge, Management.

Various aspects of sludge treatment and disposal are discussed. Sludge disposal alternatives are considered for Philadelphia, Boston, Denver, and cities in general. The previous year's conference is updated, and another seminar is summarized. The disposal methods discussed include burning and disposal onto land. The discussion of land disposal includes its effects on plants, groundwater, and human health and its use in soil stabilization and improvement. Sludge digestion and treatment are also discussed. The treatment methods include the use of high energy radiation, heat drying, and composting. Other topics discussed include institutional problems of small treatment plants, a computer program to evaluate sludge handling and disposal costs, and energy conservation practices in municipal sludge management. (See W77-00010 thru W77-00038) (Snyder-FIRL)
W77-00009

INSTITUTIONAL PROBLEMS OF THE SMALL TREATMENT PLANT,
Environmental Quality Systems, Inc., Rockville, Md.
E. J. Martin, R. DuBois, and H. Bernard.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 23-25. 4 tab.

Descriptors: *Treatment facilities, *Waste water treatment, *Municipal wastes, *Sludge treatment, *Institutional constraints, Economics, Design criteria, Activated sludge, Waste treatment, Cities, Legislation.

Problems associated with the design of small municipal waste water treatment plants are discussed, with a specific example being described. The example involves the design of a 6 million gallon/day activated sludge treatment plant which subsequently failed to meet state and Federal requirements despite original projections for future capacity needs and legislative changes. Problems encountered with the plant included: no replication of sludge handling equipment, inadequate storage and sludge thickening, makeshift sludge transfer, questionable sludge filter capacity, the use of an activated sludge system for solids storage, and various difficulties associated with a heat treatment unit. Conflicting requirements between the city's ability to comply in terms of financial resources and state and Federal demands for upgrading are discussed. (See also W77-00009) (Kreager-FIRL)
W77-00010

REGIONAL WASTEWATER SOLIDS MANAGEMENT PROGRAM LOS ANGELES-ORANGE COUNTY METROPOLITAN AREA,
Los Angeles-Orange County Sludge Program, Whittier, Calif.
For primary bibliographic entry see Field 5E.
W77-00011

COMPUTER EVALUATION OF SLUDGE HANDLING AND DISPOSAL COSTS,
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. Smith, and R. G. Eilers.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 30-59. 13 fig, 6 tab, 20 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Computer programs, *Municipal wastes, *Cost-benefit analysis, Management, Programs, Performance, Evaluation, Treatment facilities, Waste water treatment, Operating costs.

A digital computer program which is capable of examining the cost and performance of a wide variety of alternative sludge handling schemes for municipal waste water treatment plants is described. The basic computational program is known as the Executive program and contains a subroutine for each of the liqid and sludge treatment alternatives. It also contains rate and mass balance relationships necessary to generate the effluent stream vectors when one or more influent stream vectors are supplied together with certain decision variables. The subroutine sizes all structures and equipment and estimates the capital, operating, and maintenance costs associated with the process. The capability of the program is demonstrated for 261 alternative sludge treatment and disposal schemes. The program is designed to be used as a management tool to narrow the range of sludge treatment and disposal options when the site-specific conditions are known. (See also W77-00009) (Kreager-FIRL)
W77-00012

URBAN SLUDGE DISPOSAL OR UTILIZATION ALTERNATIVES, SOCIO-ECONOMIC FACTORS,
Environmental Protection Agency, Philadephia, Pa. Region III.
For primary bibliographic entry see Field 5E.
W77-00013

SLUDGE MANAGEMENT ALTERNATIVES FOR COASTAL CITIES,
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5E.
W77-00014

BY-PRODUCT SOLIDS MANAGEMENT ALTERNATIVES CONSIDERED FOR PHILADELPHIA,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5E.
W77-00015

SLUDGE DISPOSAL ALTERNATIVES FOR BOSTON,
Havens and Emerson Ltd., Cleveland, Ohio.
For primary bibliographic entry see Field 5E.
W77-00016

ALTERNATIVES FOR DISPOSAL FOR THE METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1,
Metropolitan Denver Sewage Disposal District Number 1, Commerce City, Colo.
For primary bibliographic entry see Field 5E.
W77-00017

ENERGY CONSERVATION PRACTICES IN MUNICIPAL SLUDGE MANAGEMENT,
Public Technology, Inc., Washington, D. C.
G. W. Miller.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California p 91-100. 2 fig, 6 tab, 21 ref.

Descriptors: *Sludge treatment, *Waste water treatment, *Municipal wastes, *Cost analysis, *Digestion, Byproducts, Incineration, Conservation, Methane, Energy conversion, Treatment facilities.

Municipal inventories of energy consumption associated with waste watertreatment sludge management are reviewed in relation to conserving energy in such operations. Energy consumption in waste water treatment operations in general and for sludge disposal in particular is concluded to be a major consumer in municipal government operations. Larger waste water treatment plants that process sludge by anaerobic digestion can increase the cost-effectiveness of their operations by utilizing all of the digester gas. The digester gas can be used directly to operate equipment, can be used to generate electricity, or can be sold for commercial or industrial use. It is usually not practicle to sell methane gas produced by digestion if it is possible to utilize all of it within the plant. A detailed cost analysis of the value of retaining digestion when total incineration of raw sludge is possible is presented for a particular facility. (See also W77-0009) (Kreager-FIRL)
W77-00018

UPDATING THE 1974 PITTSBURGH CONFERENCE,
Environmental Protection Agency, Washington, D. C.
D. R. Wright.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 101-108.

Descriptors: *Municipal wastes, *Waste water treatment, *Sludge treatment, *Sludge disposal, Incineration, Dewatering, Filtration, Digestion, Sewage sludge, Irrigation, Economics, Conservation, Recycling, Treatment facilities, Fertilizers, Drying.

Summaries of various projects dealing with municipal waste water and sludge treatment are presented. Specific projects discussed include: studies on the interactions between sludge thickening and other sludge treatment and disposal processes; anaerobic digester operation; a comparison of diffused air aerobic digestion with pure oxygen digestion waste activated sludge the use of pressure filtration of solids removal; the effectiveness of combining heat treatment, dewatering, and incineration for sludge treatment and disposal; the drying of sludge for marketing as fertilizer; the utilization of digested chemical sewage sludge on agricultual lands; the economics of sludge irrigation; and energy conservation and recycling techniques for waste water treatment plants. (See also W77-0009) (Kreager-FIRL)
W77-00019

SUMMARY OF THE ASCE SEMINAR ON SLUDGE DISPOSAL,
MCA Engineering Corp., Baltimore, Md.
C. M. Robson.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 109-114. 6 tab, 1 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Municipal wastes, *Reclamation, Conservation, Land use, Waste disposal.

Summaries of presentations dealing with sludge treatment and disposal delivered at the Second Annual National Conference on Environmental Engineering Research, Development, and Design sponsored by the American Society of Chemical Engineers at the University of Florida on July 21, 1975 are presented. Topics covered include: an overview of sludge handling and disposal, the treatment of sludge processing sidestreams, methods for conserving energy during sludge incineration, the landspreading of liquid municipal sludge, and the treatment of sludge for land disposal. Each summary is supplemented by information provided during subsequent question and answer periods. (See also W77-00009) (Kreager-FIRL)
W77-00020

THE PAST, PRESENT, AND FUTURE PROSPECTS OF BURNING MUNICIPAL SEWAGE SLUDGE ALONG WITH MIXED MUNICIPAL REFUSE,
Weston (Roy F.) Inc., West Chester, Pa
For primary bibliographic entry see Field 5E.
W77-00021

HIGH ENERGY RADIATION IN SLUDGE TREATMENT - STATUS AND PROSPECTS,
Environmental Protection Agency, Cincinnati, Ohio.
J. B. Farrell.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 123-133. 6 fig, 3 tab, 21 ref.

Descriptors: *Radiation, *Waste water treatment, *Sludge treatment, *Sewage, Microorganisms, Chemical oxygen demand, Economics, Chlorine, Oxygen, Heat, Waste treatment, Sewage sludge, Chlorides, *Radiation.

The use of high energy radiation for treating waste water and sewage sludge is discussed in terms of past experience and future prospects. Experimental work with sewage sludge indicates that high significant levels of microbial reduction occur at irradiation levels under 1.0 megarad. Cost studies indicate unrealistically high levels for sewage treatment but not necessarily for sludge. Synergistic effects on reductions in microbial levels appear to occur when radiation is combined with chlorine, heat, or zinc chloride. Radiation also reduces the chemical oxygen demand levels of aqueous solutions of certain chemicals at radiation levels less than 0.2 megarad, but much higher levels are required for significant effects with sewage. Radiation treatment apparently improves the settling rate and filterability of sewage sludge although the effect is not large. Future prospects for improving radiation effectiveness hinge around the effect of oxygen addition, although this approach may be limited by the solubility of oxygen in sludge. There is also the possibility of irradiating raw sludge for subsequent disposal into the ocean or for landspreading purposes. Major research programs dealing with radiation treatment of wastes are outlined. (See also W77-0000 (Kreager-FIRL)
W77-00022

MANAGEMENT OF MUNICIPAL WASTE WATER TREATMENT RESIDUALS,
National Science Foundation, Washington, D. C.
E. H. Bryan.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 1-138.

Descriptors: *Waste water treatment, *Sludge treatment, *Research priorities, *Municipal wastes, Model studies, Injection wells, Radiation, Viruses, Nutrients, Management, Simulation analysis, Domestic wastes, Industrial wastes, Economics, Land use.

Research projects sponsored by the National Science Foundation and dealing with the management of municipal waste water treatment residuals are reviewed. The projects involve the following: the design of a tractor-implement for injecting sludge into soil at a rate of up to 800 gallons/minute; the development of an analytical model of subsurface injection; the potential use of high-energy electrons for the disinfection of municipal waste water treatment residuals; the extent of virus survival in soils subjected to municipal sludge application; the control of virus pathogens by irradiation; the process selection for optimum management of regional waste water treatment residuals; the potential utilization of wetlands for their ability to remove nutrients from domestic waste water that has received secondary treatment; the use of simulation to provide a better understanding of water, nutrient, and general ecosystem functions; the use of injection wells for industrial waste management; and the relationships between regionalization of waste water systems and economies of scale. (See also W77-00009) (Kreager-FIRL)
W77-00023

PYROLYSIS OF SEWAGE SLUDGE,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W77-00024

SLUDGE PYROLYSIS FOR ENERGY RECOVERY AND POLLUTION CONTROL,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 5E.
W77-00025

A SLUDGE POLICY FOR THE 70'S,
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5E.
W77-00026

ECOLOGICAL IMPACT OF THE DISPOSAL OF MUNICIPAL SLUDGE ONTO LAND,
McCormick (Jack) and Associates, Inc., Devon, Pa.
For primary bibliographic entry see Field 5E.
W77-00027

PLANT UPTAKE OF HEAVY METALS FROM SEWAGE SLUDGE APPLIED TO LAND,
Department of Agriculture, Beltsville, Md.
R. L. Chaney, M. C. White, and P. W. Simon.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 169-178. 7 fig, 10 tab, 31 ref.

Descriptors: *Sludge disposal, *Plant tissues, *Heavy metals, *Food chains, *Cadmium, *Toxicity, Soil analysis, Soil chemistry, Soil treatment, Zinc.
Identifiers: Composting.

Field and greenhouse experiments with sludge and composted sludge as well as studies involving the analysis of sludges currently applied to agricultural land conducted to investigate potential hazards associated with heavy metal uptake by plants. The results indicated that composting reduced the sludge metal availability to plants in addition to being desirable from the standpoint of pathogen reduction, odor control, drying, and ease of handling. Composting also generally produced a material which initially raised the soil pH and did not cause as much subsequent slow lowering of soil pH as digested sludge did. Plant cadmium uptake was extremely complex, depending on such factors as soil cadmium level, soil pH, the levels of other heavy metals in the soil, plant species and variety, and temperature. The experimental results indicate that the food chain should be adequately protected from sludge-borne cadmium if sludge use on cropland is restricted to only those sludges with a cadmium level equal to or less than 1% of the zinc content. (See also W77-00009) (Kreager-FIRL)
W77-00028

EFFECTS OF SEWAGE SLUDGE OR EFFLUENT APPLICATION TO SOIL ON THE MOVEMENT OF NITROGEN, PHOSPHORUS, SOLUBLE SALTS AND TRACE ELEMENTS TO GROUNDWATERS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W77-00029

ENVIRONMENTAL EFFECTS OF SLUDGE DISPOSAL IN SANITARY LANDFILLS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5C.
W77-00030

IMPACT OF LAND DISPOSAL OF SLUDGES ON GROUNDWATER,
Geraghty and Miller. Port Washington, N.Y.
For primary bibliographic entry see Field 5B.
W77-00031

ENGINEERING STUDY AND FIELD DEMONSTRATION TRIALS FOR SAND DUNE STABILIZATION,
Ward (George D.) and Associates, Portland, Oreg.
For primary bibliographic entry see Field 5E.
W77-00032

POTENTIAL HEALTH IMPACTS OF SLUDGE DISPOSAL ON THE LAND,
Environmental Protection Agency, Research Triangle Park, N.C.
For primary bibliographic entry see Field 5C.
W77-00033

FDA'S OVERVIEW OF THE POTENTIAL HEALTH HAZARDS ASSOCIATED WITH THE LAND APPLICATION OF MUNICIPAL WASTEWATER SLUDGES,
Food and Drug Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W77-00034

A SUMMARY OF OBSERVATIONS ON THERMOPHILIC DIGESTER OPERATIONS,
Los Angeles Sanitation Bureau, Playa del Rey, Calif. Hyperion Treatment Plant.
G. T. Ohara, and J. E. Colbaugh.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 218-226. 10 fig, 9 tab, 4 ref.

Descriptors: *Waste water treatment, *Chemical oxygen demand, *Treatment facilities, *Sludge digestion, *Thermophilic bacteria, Investigations, Dewatering, Methane.
Identifiers: *Thermophilic digestion.

Observations made while investigating two applications of thermophilic sludge digestion are reported. The applications concern the enhancement of the sludge dewatering process under certain conditions when thermophilically digested sludge is used instead of mesophilically digested sludge and methane gas production during thermophilic digestion in comparison to mesophilic digestion. The investigations were conducted at a Los Angeles treatment plant. Thermophilically digested sludge and a solid bowl centrifuge produced a drier sludge cake, contained less suspended material in the centrate, required less chemical conditions than mesophilic sludge, and permitted a higher sludge feed rate. This combination was the only one to essentially meet all the dewatering requirements. Heating digesters to 120 F for thermophilic digestion requires 69% more BTUs than heating them to 95F for mesophilic digestion. There is some evidence that the centrate from thermophilic sludges contains a greater amount of certain dissolved heavy metals. Also, centrate-filtrate from thermophilic sludges contained approximately 30% higher chemical oxygen demand (COD) than mesophilic centrate. Thermophilic bacteria appear more sensitive to loading and temperature changes than mesophilic bacteria. Thermophilic sludges were easier to dewater in some situations. Thermophilic particles are coarser than mesophilic particles. Volatile acid levels are 400-500 mg/liter in thermophilic digestion, compared to 100-200 mg/liter for mesophilic digestion. There is some evidence that methane gas production is higher and gas quality is lower for thermophilic digestion, when compared to mesophilic digestion. (See also W77-00009) (Snyder-FIRL)
W77-00035

UTILIZATION OF METHANE FROM SLUDGE DIGESTION,
Greeley and Hansen, Chicago, Ill.
S. K. Kapoor, and D. Newton
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 227-234. 3 fig, 1 tab, 27 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Methane, *Sludge digestion, Chemicals, Industrial production, Sewage treatment, Economic efficiency, Heating, Storage, Feasibility, Ammonia, Supply.
Identifiers: Chemical production, Methanol.

Numerous conventional uses of sludge gas are restated and the feasibility of sludge gas utilization for production of chemicals is discussed. It appears that both sludge gas utilization and production should be maximized. Increased energy requirements due to proposed secondary treatment at all plants call for more intensive use of sludge for plant purposes. Historical modes of sludge gas utilization are believed to be the most economical. These include generation of electricity; direct operation of pumps and blowers; and hot water or steam production for space heating, air-conditioning, and digester heating. In-plant storage will help increase utilization by equalizing essentially diurnal fluctuation in supply and demand. In some places, the conventional uses may not be feasible; use of sludge gas to produce ammonia or methanol for in-plant use should be investigated. If applicable, ammonia can be used to fortify sludge for use as soil conditioner or fertilizer. In exceptional cases, sludge gas has been effectively sold to a gas-using industry or utility. Commercial use of sludge gas is likely to become more cost effective as natural gas and other energy sources diminish in supply and become more expensive. (See also W77-00009) (Snyder-FIRL)
W77-00036

PROCESSING, ECONOMICS AND SALE OF HEAT DRIED SLUDGE,
Environmental Protection Agency, Cincinnati, Ohio.
G. Stern.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 235-244. 4 fig, 7 tab, 34 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Economics, *Drying, Municipal wastes, Waste water(Pollution), Heat treatment, Horticulture.

Heat drying of municipal waste water sludge is reassessed. Undigested sludge can be heat treated to produce a useful product for agriculture and horticulture. Heat drying destroys most of the bacteria. Various types of direct heat dryers can be used. The energy requirements for producing equivalent amounts of nitrogen from sludge or commercial fertilizer can be comparable. While expensive, heat drying can be a relatively cheaper alternative to sludge disposal for many municipalities if the final product can be successfully marketed. Trends indicate that over one-third of the sludge to be produced in 1985 will be waste activated sludge, the kind that has been successfully marketed. Heat dried sludge sales are directed toward four major markets: industrial fertilizer compounders, citrus growers, nursery/horticulture/turf grass markets, and retail sales. Heat dried sludge offers slow-release organic nitrogen, other organics that improve the physical structure of soils, and trace elements such as zinc. Marketing heat dried sludge might best be done by a commercial firm. The rapid increase in commercial fertilizer cost is an added incentive to using heat dried sludge. (See also W77-00009) (Snyder-FIRL)
W77-00037

COMPOSTING RAW SLUDGE,
Agricultural Research Service, Beltsville, Md.
E. Epstein, and G. B. Willson.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 245-248. 2 fig, 2 tab, 8 ref.

Descriptors: *Treatment facilities, *Sewage sludge, *Aeration, *Air, *Air circulation, Odor, Gases, Temperature, Monitoring, Sewage treatment, Waste water treatment, Equipment.
Identifiers: *Composting, Compost.

Since windrow composting of raw sludge was previously tried and proved unsatisfactory, a forced aeration method was developed. The forced aeration system uses a pile of raw sludge mixed with woodchips or shredded bark to provide bulk. A vacuum is used to draw air through the pile. The pile is covered with finely screened compost from previous operations to prevent odoriferous gases from escaping into the atmosphere. Gases removed from the pile are scrubbed by passing through another pile of screened compost. This method of composting shows promise for controlling the odors associated with windrow composting of raw sewage sludge. The covering of screened compost ensures that all of the raw sludge reaches temperatures above the thermal death point of most pathogens. Measuring temperature and oxygen is the only monitoring required. The method can be adapted readily for use by either large or small sewage treatment plants. It requires only a modest investment in equipment. (See also W77-00009) (Snyder-FIRL)
W77-00038

SLUDGE DRYING BEDS ARE PRACTICAL, PART 1,
J. A. Beardsley.
Water and Sewage Works, Vol. 123, No. 7, p 82-84, July, 1976.

Descriptors: *Sludge treatment, *Dewatering, *Design criteria, *Drainage systems, Pipelines, Drying, *Waste treatment, Materials, Performance.

The use of new designs and chemical treatment for reducing the space and labor required by sludge drying beds is discussed. Two distinct improved designs for sludge drying beds are emerging. The first is a full sand bed with the underdrain system improved so that the clay tile is not crushed by the weight of an end loader. Strong perforated plastic drainpipe or some other means can be used to protect the tile from the load. The second design involves alternating sand and cement strips, with the latter being spaced at wheel distances for the end loader. Provisions for draining surface water can be incorporated at intervals in the bed wall so that rainwater or free water released by chemical treatment may be quickly drained off. This is particularly important in modifying existing hard-bottom beds to optimize chemical use. (Kreager-FIRL)
W77-00039

CHEMICAL CHANGES IN THE SOIL SOLUTION FROM A SPODOSOL IRRIGATED WITH SECONDARY-TREATED SEWAGE EFFLUENT,
Florida Agricultural Experiment Station, Gainesville. Soil Science Dept.
For primary bibliographic entry see Field 5E.
W77-00040

CROSS-FLOW FILTRATION IN PHYSICAL-CHEMICAL TREATMENT OF MUNICIPAL SEWAGE EFFLUENTS,
Oak Ridge National Lab., Tenn.
H. A. Mahlman, W. G. Sisson, K. A. Kraus, and J. S. Johnson, Jr.
Report EPA-600/2-76-025, February, 1976. 127 p, 54 fig, 11 tab, 38 ref. ORNL/TM-5423.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, *Filtration, *Activated carbon, Biological treatment, Sewerage, Chemical precipitation, Tertiary treatment, Nutrient removal, Organic matter, Phosphates, Iron, Turbidity.
Identifiers: Cross-flow filtration.

Exploratory investigations were performed on the use of cross-flow filtration of primary and secondary municipal sewage effluents. In this approach, the solution being filtered is pumped parallel to the filter. Thickening of flux-limiting filtercake is slowed, and the original stream is separated into a large volume of filtrate and a concentrated slurry of solids. The effects of pressure, circulation velocity, additive concentration, water recovery, pH, and other variables were investigated. Filtrate from primary effluent treated with iron or aluminum salts, with powdered activated carbon (PAC), or with both hydrolyzable ions and PAC, was generally of quality superior in turbidity, organic carbon, and other respects to the effluent from biological secondary treatment. Turbidities were usually well below 1 JTU; bacteria were substantially removed. With iron or aluminum salts, filtrate total organic carbon (TOC) typically was 10 to 15 mg/liter, and phosphate below one mg/liter. With PAC, TOC was usually about 5 mg/liter, but phosphate removal was poor. With about 0.001 M iron(III) average fluxes of about 6 m/d appear attainable at 4.6 m/sec circulation velocity with 24 hr backwash intervals. Filtrate cost for a 3,800 cu m/d plant using iron salts was estimated at $.12/cu m. When feed is activated sludge secondary effluent, fluxes and product characteristics are similar, except that TOC is lower. With iron or aluminum salts, unless pH is adjusted to the neutral range before filtration, filtrate is substantially contaminated with the salts. An effluent low in phosphate and TOC was obtained by second-stage filtration of primary sewage filtrate treated with PAC and hydrolyzable ions. (Snyder-FIRL)
W77-00042

REVIEW OF THE MUNICIPAL WASTE WATER TREATMENT WORKS PROGRAM,
Environmental Protection Agency, Washington, D.C. Construction Grants Review Group.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 923, Price codes: A05 in paper copy, A01 in microfiche. EPA Miscellaneous Report, November 30, 1974. 93 p, 1 fig, 23 tab, append.

Descriptors: *Waste water treatment, *Treatment facilities, *Waste water(Pollution), *Waste treatment, *Programs, Municipal wastes, Grants, Construction.

The grants program for construction of municipal waste water treatment facilities is reviewed. An adequate program is defined. The many requirements were aggregated into the principal goal of achieving the most cost-effective abatement of municipal waste water pollution through the proper planning, design, construction, and operation of treatment works. This goal includes five subgoals: managing the program efficiently and with sufficient resources for adequate performance, ensuring that projects are constructed in a timely manner by expeditiously obligating funds, ensuring the environmental soundness of the projects by managing the environmental impact statement process effectively, detecting and deterring fraud and other irregularities, and protecting the responsibilities of the states in water pollution control. Cost-effectiveness is defined as including social, environmental, and non-monetary costs. One possible strategy summarizes the manpower requirements of the adequate strategy. It would permit a relatively high achievement of the cost-effectiveness goal and its subgoals. A second possible strategy would require less staff but could seriously sacrifice achievement of program goals. Two other possible strategies would reduce federal staffing needs, but would increase those of the states through the delegation of additional responsibilities. (Snyder-FIRL)
W77-00043

REMOVAL VS BENEFITS: IT CAN BE TOO COSTLY,
Kansas City Water and Pollution Control Depts., Mo.
D. R. Boyd, Jr., J. R. Popalisky, J. D. Reece, and D. McMurtrey.
Water and Wastes Engineering, Vol. 13, No. 2, p 42-44, February, 1976. 4 fig.

Descriptors: *Sewage treatment, *Nutrients, *Waste water treatment, *Water purification, *Water quality control, Missouri river, Missouri, Cities, Municipal wastes, Economics, Treatment facilities.

Complete nutrient removal at sewage treatment facilities discharging to the Missouri River is discussed in terms of the resulting benefits versus the costs. The volume of sewage at Kansas City is less than 1% of the minimum Missouri River flow in the area, and this fact combined with detection and removal of nutrients at the Kansas City water treatment facility where the volume of water requiring treatment for nutrient removal is less than 1.0% of the river flow is cited as reason for not removing nutrients at sewage treatment facilities. The quality of water currently in the Missouri River is such that advanced waste treatment for Kansas City would probably have an insignificant effect on the quality of the water in the receiving stream. (Kreager-FIRL)
W77-00044

WASTEWATER SLUDGE AS A FERTILIZER SUBSTITUTE,
Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 5E.
W77-00046

DISCOUNTED CASH FLOW ANALYSIS TO SELECT EQUIPMENT,
Entech Corp., Dumont, N. J.
R. Briller.
Journal of the Environmental Engineering Division-ASCE, Vol. 102, No. EE3, p 595-611, June, 1976. 6 tab, 2 ref.

Descriptors: *Cost analysis, *Waste water treatment, *Aeration, *Efficiencies, *Cost comparisons, Economics, Equipment, Operating costs, Capital costs.

discounted cash flow analysis method for select- waste water treatment equipment with the west overall cost is presented. Operating and pital costs as well as equipment life and discount e are used as input for a specific example in- lving surface aerators in a municipal sewage atment plant. Realistic values in terms of capital d operating costs, inflation rate, and other varia- s are also used in the example. The results show t an aerator which costs $5000 more but uses 4- orsepower less and one-fifth as much lubricat- oil is $5723 cheaper than another aerator in ms of the present value of the total overall sts. The most sensitive variable in the example the efficiency of the aerators. An improvement 4.2% in the efficiency of the cheaper aerator is fficient to eliminate the overall cost differential. general examination of the sensitivity analysis ed for the above example reveals that variables hich are less critical in the example problem can come more significant for cases where different lues of the independent variables are used. reager-FIRL)
77-00049

ASTES FIND FERTILE FIELD AS LOW-COST ANT NUTRIENTS,
r primary bibliographic entry see Field 5E.
77-00050

QUALIZATION OF TIME VARIABLE WASTE OADS,
arquette Univ., Milwaukee, Wis. Dept. of Civil ngineering.
Novotny, and R. M. Stein.
urnal of the Environmental Engineering Divi- n-ASCE, p 613-625, June, 1976. 7 fig, 2 tab, 16 f.

escriptors: *Waste water treatment, *Model stu- es, *Mathematical models, *Flow, *Unsteady w, Flow characteristics, Equalizing reservoirs, ydraulic structures, Hydraulic transients, ydraulics, Analytical techniques.

mathematical model describing influent varia- lity removal in waste water treatment systems is esented. Input-output relationships for mpletely mixed basins, dispersed flow basins, d plug flow basins are developed using time-se- es analysis and transformation in the frequency main. The models describe equalization of con- ntration or waste load fluctuations assuming ear systems with first-order decay. Model- rived design formulas for purely random and rmonic inputs are obtained, assuming complete- mixed treatment systems. The model approach demonstrated and verified by an evaluation of e performance of two dispersion flow equaliza- n basins and completely mixed laboratory units. ie evaluation results indicate good agreement tween measured and computed equalization aracteristics. (Kreager-FIRL)
77-00052

OW APPROACHING FILTER WASHWATER ROUGHS,
mp, Dresser and McKee, Inc., Boston, Mass.
A. French.
urnal of the Boston Society of Civil Engineers ction American Society of Civil Engineers, Vol. , No. 4, p 139-160, January, 1976. 8 fig, 1 tab, 12 f.

escriptors: *Filtration, *Mathematical models, low, *Filters, Hydraulics, *Design criteria, paration techniques, *Waste water treatment, rformance, Evaluation, Suspended solids.
entifiers: *Filter backwashing, Backwashing .

potential flow model is used to study the flow of ckwash water (laden with filtered solids) in its ogress from the top of the filter bed to the wash- ter troughs above the filter. For a given trough acing, the round-bottom trough that minimizes the region of nonuniform flow above a filter bed is one with an external total width equal to 0.25 times the center-to-center spacing and with a total external draft equal to 0.20 times the center-to-center spacing. This design also promotes more efficient flushing of floc particles from the filter. Diminution of the nonuniform flow region and more efficient flushing can also be promoted by decreasing the trough spacing, but there are practical lower limits to trough spacing. Paths and travel times of fluid elements and suspended particles are investigated for the above optimal trough design and two alternative designs. (Kreager-FIRL)
W77-00053

WATER-REUSE SYSTEMS STAR AT CINCINNATI AICHE MEETING,
L. J. Ricci.
Chemical Engineering, Vol. 83, No. 15, p 86, 88, July 19, 1976. 1 fig.

Descriptors: *Water reuse, *Reclaimed water, *Waste water treatment, *Reclamation, *Symbiosis, Activated sludge, Reverse osmosis, Filtration, Adsorption, Ion exchange, Sludge, Industrial wastes, Phosphorus, Pilot plants, Organic compounds, Chemical wastes.
Identifiers: Ultrafiltration.

Laboratory and pilot-scale developments in water reuse systems are reviewed. A new pilot-scale scale system that renovates organic chemical-laden waste water for reuse in manufacturing operations is described that combines activated sludge treatment, physical/chemical treatment, reverse osmosis, and primary and secondary ion exchange. Another pilot unit has demonstrated the effectiveness of ultrafiltration for concentrating dilute latex waste waters for reuse. Laboratory studies have determined that certain natural and synthetic adsorbents are effective for removing leachate contaminants from various industrial sludges. The adsorption materials include fly ash, bottom ash, zeolite, vermiculite, illite, kaolinite, cullite, activated carbon, and activated alumina. Other laboratory studies have shown that flue gas desulfurization gypsum sludges hold potential as efficient removers of phosphorus from waste waters. However, undesirable contaminants such as sulfates in the sludge solubilize in the waste water and may cause environmental problems. (Kreager-FIRL)
W77-00054

AWT PLANT BEGINS OPERATIONS.
Public Works, Vol. 107, No. 8, p 104, August, 1976.

Descriptors: *Tertiary treatment, *Waste water treatment, *Reclamation, *Reclaimed water, *Treatment facilities, Activated sludge, Nitrification, Denitrification, Bacteria, Viruses, Suspended solids, Oxygen demand, Chlorination, Sewage, Storm water, Illinois, Municipal wastes, Cities, Ammonia, Nitrates, Nitrites, Nitrogen.
Identifiers: *Chicago(Ill).

An advanced waste water treatment plant owned by the Metropolitan Sanitary District of Greater Chicago is described. Plant design is based on a biological nitrification-denitrification process. A two-stage activated sludge treatment process is used to convert ammonia to nitrites and nitrates which eventually are released as nitrogen gas after the addition of methanol to assist the biological reaction. The resulting effluent is so low in oxygen demand, suspended solids, and viral and bacterial content that it meets all national pure water policy criteria and allows for downstream recreational uses. The facility will treat 50 million gallons/day of waste water from the Chicago suburbs of Schaumberg and Palatine as well as provide primary treatment and chlorination for approximately 100 million gallons/day of combined storm and sewage overflows before discharge to Salt Creek. (Kreager-FIRL)
W77-00055

ACTIVATED CARBON ODOR CONTROL SYSTEM,
Hagerstown Water Pollution Control, Md.
M. G. McGauhey, and R. L. Poltorak.
Public Works, Vol. 107, No. 7, p 47, July, 1976.

Descriptors: *Activated carbon, Odor, *Sludge, *Sewage treatment, Hydrogen sulfide, Organic compounds, Treatment facilities, Equipment, Costs.
Identifiers: Odor control.

An activated carbon system for removing sewage treatmet odors resulting from the conversion of two primary clarifiers to sludge thickeners is described. The thickeners are covered with an 80 by 30 foot gabled roof. Pressure gages are placed on the discharge lines to allow plant operators to adjust the level of air pressure without entering the covered area. A 10 by 10 foot carbon filter building houses fiberglass reinforced grid which is covered with a polypropylene mesh screen to retain 3000 pounds of granulated activated carbon. A 4000 cubic foot/minute blower draws the gases from the thickeners through the 3-foot bed of carbon where hydrogen sulfide and organic compounds are stripped from the air. An adjacent sludge well is also vented through the filter, correcting an additional odor problem. Equipment and component system costs amount to about $15,000. (Kreager-FIRL)
W77-00056

AUTOMATIC HIGH DENSITY SLUDGE DISCHARGE CONTROL USING ULTRASONICS.
Water Services, Vol. 80, No. 964, p 372, June, 1976. 2 fig.

Descriptors: *Waste water treatment, *Sludge treatment, *Automatic control, *Automation, *Density, Equipment, *Ultrasonics, Electrical equipment, Flow.

A high density sludge discharge controller which uses ultrasonics to automatically detect the level and density of raw sludge being transferred to digester or disposal systems and to minimize unwanted transfer of water is described. The sludge density controller which consists of a glass-lined pipe section fitted with two ultrasonic crystal sensors is installed in the sludge outlet line. The control unit may be mounted on the pipe section or located at a remote site. The plant process timer starts the transfer of sludge in accordance with a preset schedule by operating a pump or motorized valve. An external delay timer of several minutes duration overrides the function of the sludge density controller until the pipe is clear of low density sludge from the previous transfer cycle. Thick sludge then passes to the digester until the sludge density controller detects a decrease in percentage of solids being transferred. When the decreased percentage of solids continues to remain at less than the set point for more than 10 seconds, the sludge density controller operates to shut off the pump or valve. A sludge level control may also be incorporated into the system to detect and control the sludge level in settling tanks. (Kreager-FIRL)
W77-00058

WASTEWATER PLANT DESIGN REDUCES OFF-SITE ENERGY NEEDS.
Water and Sewage Works, Vol. 123, No. 2, p 41-43, February, 1976. 3 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Design criteria, *Energy conversion, Economics, Conservation, Municipal wastes, Sludge treatment, Methane, Sewage treatment.

A waste water treatment plant design that minimizes off-site energy requirement is described. The design is expected to result in a projected savings of $3594 in heating oil and $875 in electricity annually by the integrated use of

solar collectors, heat pumps, a small building shell, and basic concrete materials. Methane gas produced by the plant's waste treatment process and an electric generator will provide energy on cloudy days. The process design flow is for 450,000 gallons of sanitary sewage/day. Treatment is to be primary and secondary, including screening, bacteria-nutrient-oxygen-interfacing, settlement, and sludge digestion. The effluents will consist of chlorinated water and dewatered sludge. The plant is designed to service a community of 4200 residents. (Kreager-FIRL)
W77-00059

OXYGEN FOR EFFLUENT TREATMENT.
Water Services, Vol. 80, No. 964, p 379-380, June, 1976. 2 fig.

Descriptors: *Oxygenation, *Activated sludge, *Waste water treatment, *Bubbles, Equipment, Treatment facilities, Performance, Waste treatment, Liquid wastes, Biological treatment.
Identifiers: Sludge bulking.

The use of oxygen injection for improving effluent treatment is discussed. Two oxygenation systems currently available are described. In one of these systems, bubbles are generated by introducing oxygen in fine bubble form using a high pressure stream of liquor. When the water and gas enter a sludge tank through expansion nozzles, the already small bubbles are shattered into millions of quickly dissolving micro-bubbles. The other system is a bell-shaped diffusor which achieves highly efficient dissolution by maintaining a suspension of bubbles in a flowing column of liquor contained within an open based bell. The varying velocities of the liquor ensure retention of bubbles of all useful sizes, thus enabling virtually total oxygen dissolution. Both systems are useful for preventing anaerobicity in activated sludge systems and thus avoiding sludge death and subsequent sludge bulking. (Kreager-FIRL)
W77-00060

NEW ACTON GRANGE WORKS.
Effluent and Water Treatment Journal, Vol. 16, No. 5, p 248-250, May, 1976. 1 fig.

Descriptors: *Sewage treatment, *Treatment facilities, *Activated sludge, *Biological treatment, Aeration, Sludge treatment, Weirs, Retention, Flow control.
Identifiers: *United Kingdom.

A new sewage treatment facility in the United Kingdom is described. The new facility is an activated sludge type and is designed to produce a final effluent meeting the Royal Commission Standard. The facility will serve both existing and proposed needs within the parishes of Appleton, Grappenhall and Thelwall, Stockton Heath, Stretton, Halton, and Walton. The preliminary treatment consists of the use of curved bar screens; solids deposited on the screens pass through a disintegrator and return to the flow and then go to detritors that automatically remove any grit. Any flows which are greater than three times that of the normal anticipated dry weather flow pass over an overflow weir into storm water balancing tanks for retention and subsequent treatment. The remaining sewage flows to primary settling tanks, aeration tanks, and final settling tanks before biological treatment. Sludge from the primary tanks is pumped into sludge holding tanks for up to 28 days retention. (Kreager-FIRL)
W77-00061

SAN DIEGO: CIVIL ENGINEERING INNOVATIONS ABOUND.
Civil Engineering-ASCE, Vol 46, No. 2, p 68-73, February, 1976. 1 fig, 1 tab.

Descriptors: *Sewage treatment, *Treatment facilities, *Municipal wastes, *Pacific Ocean, Tertiary treatment, Water pollution effects, California, Cities, Water reuse, Recycling, Planning, Aquiculture, Heavy metals, Viruses.
Identifiers: *San Diego(Calif).

Plans for upgrading municipal sewage treatment in San Diego are discussed. Presently, San Diego's municipal sewage receives only primary treatment, with discharge being to the Pacific Ocean through a 2-mile outfall sewer. Current plans call for sticking with primary treatment but increasing the plant capacity to provide full primary treatment of the higher-than-design flows now being treated. The usefulness of upgrading to secondary treatment is questionable since 12 years of monitoring data indicate that the impact of treatment plant discharges on ocean life is not acute. Eventually, the city plans to upgrade to tertiary treatment and recycle the tertiary effluent. Uncertainties concerning the effect of heavy metals and viruses on people, however, call for a cautious approach in terms of recycling treated water back to the water supply system. Consideration is also being given to the possible practice of aquaculture around sewage outfalls. (Kreager-FIRL)
W77-00063

RECENT ADVANCES IN SLUDGE TREATMENT AND DISPOSAL,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
W. H. Schroeder, and D. B. Cohen.
Water and Pollution Control, Vol. 114, No. 7, p 15-21, 24-25, 27, 38-39, July, 1976. 10 fig, 3 tab.

Descriptors: *Sludge treatment, *Sludge disposal, *Reclamation, *Byproducts, Waste disposal, Biochemical oxygen demand, Suspended solids, Biological treatment, Waste storage, Waste treatment, Dewatering, Drying, Fertilizers, *Reviews.
Identifiers: Literature reviews.

Advances in sludge treatment and disposal are reviewed. Topics discussed include: sludge stabilization, conditioning, dewatering, drying, and reduction; the use of treated sludge as a fertilizer and soil improvement agent; land reclamation uses; landfill disposal; energy and resource recovery processes; ocean disposal; and underground storage and disposal of sludge. Anaerobic digestion is receiving renewed interest because of the potential benefits of methane production, new design alternatives based on kinetic models, and the present emphasis on land application of digested sludge. However, anaerobically digested mixtures often produce supernatant recycle which is high in biochemical oxygen demand and suspended solids. A recent advance in anaerobic digestion involves thermophilic operation of the digesters as compared to operation in the mesophilic range. (Kreager-FIRL)
W77-00064

IS NUTRIENT REMOVAL WORTHWHILE,
Iowa State Univ., Ames. Dept. of Animal Ecology.
R. W. Bachmann, and J. R. Jones.
Water and Wastes Engineering, Vol. 13, No. 2, p 14-16, February, 1976. 2 fig.

Descriptors: *Waste water treatment, *Nutrient removal, *Phosphorus, *Lakes, *Evaluation, Mathematical models, Surface water, Water quality control, Eutrophication.

An objective basis for evaluating the potential benefits of removing nutrients from waste water to prevent eutrophication of surface waters is presented. The initial step in the process is to determine whether nutrient removal will exert a significant effect on the receiving bodies of water. A semi-empirical equation for determining the concentration of phosphorus in natural lakes is presented to illustrate that the phosphorus concentration is directly proportional to the annual inputs and inversely proportional to the depth of the lake. The magnitude of the reduction in phosphorus load to a given body of water from a nutrien removal program ultimately depends on the rela tive amounts of phosphorus being contributed t the lake from other sources such as surface runof and rainfall. A study of 34 streams in Iowa i presented to illustrate that in this case few benefit from nutrient removal at waste water facilities ar likely to result because of the relatively heav loadings from nonpoint sources. (Kreager-FIRL)
W77-00065

ECOLOGICALLY BALANCED COMMUNIT WASTEWATER DISPOSAL SYSTEM MANAGEMENT FOR DEVELOPING COUN TRIES,
Jadavpur Univ., Calcutta (India).
N. Chaudhuri, and A. Basu.
Journal of the Institution of Engineers (India Vol. 56, Pt. EN2, p 71-75, February, 1976. 5 fig, tab, 7 ref.

Descriptors: *Reclamation, *Reclaimed wate *Waste water treatment, *Cities, Program Economics, Lagoons, Sludge, Fish farming, Fe tilizers, Land use, Symbiosis, Asia.
Identifiers: *India.

A water reclamation management program fo urban centers in India is proposed. The progra involves the use of stabilization lagoons for was water treatment, the use of primary sludge as fe tilizer in surrounding greenbelt areas, and the co version of algae into fish protein through piscicu ture. Cost estimates for both stabilization lagoo and bio-filters are presented for urban commun ties in India and indicate that the use of lagoo reduces the treatment costs by two-thirds a saves 185 megawatts of power. The propose reclamation system is land-intensive, requiri 3.24 hectares for primary and secondary lagoon 1.21 hectares for pisciculture and recreation, a 17.82 hectares for land treatment in order reclaim 4.54 million liters/day of waste wate (Kreager-FIRL)
W77-00066

POWDERED ACTIVATED CARBON I PROVES ANAEROBIC DIGESTION,
Norristown Sewage Treatment Plant, Pa.
M. Hunsicker, and T. Almeida.
Water and Sewage Works, Vol 123, No 7, p 62-6 July, 1976. 1 fig.

Descriptors: *Activated carbon, *Sewage trea ment, *Digestion tanks, *Treatment facilitie Odor, Costs, Performance, On-site tests, Evalu tion, Digestion, Sludge, *Anaerobic digestion.

The use of powdered activated carbon to impro anaerobic digestion at a sewage treatment plant described. Starting with an initial slug of 18 pounds of activated carbon to each prima digester, followed by a dose of 350 pounds/d thereafter, improved supernatant quality and i creased gas production were observed a mon after application. Prior to carbon use, relative poor supernatant clarity limited the amount of r sludge that could be added to the digesters about 33,000 gallons/day. After carbon additi twice this volume was drawn while still returning cleaner supernatant to the pre-aeration chambe Plant odors are also reduced. Secondary efflue quality is more uniform than it is prior to carb addition and is meeting all applicable standard The cost incurred in purchasing the activated c bon has been far offset by savings resulting fro the elimination of deodorant chemicals at t plant. (Kreager-FIRL)
W77-00067

FUNCTIONAL DESIGN OF SANITAR SEWERS,
Pakistan Univ. of Engineering and Technolog Lahore. Inst. of Public Health Engineering a Research.
K. M. Yao.

Journal Water Pollution Control Federation, Vol 48, No 7, p 1772-1778, July, 1976. 5 fig, 5 ref.

Descriptors: *Sewers, *Design criteria, *Hydraulics, Chemical reactions, *Self purification, Hydraulic structure, Sanitary engineering, Engineering structures, Conveyance structures, Roughness coefficient, Hydrogen sulfide.

Criteria for the design of sanitary sewers are reviewed. The functional design of sanitary sewers involves the consideration of three items: hydraulics, self-cleaning action, and biochemical reactions. In current practice, it is assumed that self-cleaning of sanitary sewers is obtained by maintaining a minimum velocity of flow regardless of sewer size. However, a more rational approach may be to use the critical shear stress as the basis for the design of self-cleaning sewers since the basic mechanism of self-cleaning action is the hydrodynamic shear exerted on the sewer boundary by the flowing waste water. The design requirements of the critical shear stress approach for self-cleaning action tend to follow a pattern similar to those for hydrogen sulfide control. In both cases, the required minimum velocity increases with sewer size. For sewers with a Manning's roughness coefficient of 0.013 or less, a design critical shear stress in the range of 0.03-0.04 lb/sq ft will probably keep self-cleaning sanitary sewer systems free of hydrogen sulfide problems. For sewers with a Manning's roughness coefficient of 0.015 or greater, a design critical shear stress of 0.04 lb/sq ft seems preferable to achieve the same effects. These conclusions are valid at least within the size range up to about 60 in. (Kreager-FIRL)
W77-00068

TUNNELLING MACHINE USED FOR DRAIN TUNNEL FOR ROUNDHILL SEWAGE TREATMENT WORKS BREAKS RECORD.
For primary bibliographic entry see Field 8C.
W77-00069

SEWERING THE CITY OF NEW YORK,
New York City Environmental Protection Administration.
M. Lang, C. Samowitz, M. Jethwani, and F. Novotny.
Civil Engineering-ASCE, Vol 46, No 1, p 54-57, January, 1976. 2 fig, 1 tab.

Descriptors: *Sewers, *Sewerage, *Hydraulic structures, *Costs, *Programs, New York, Conveyance structures, Economics.
Identifiers: *New York City.

Efforts to update New York City's sewage collection system are reviewed along with current financial constraints hindering further development. Between the years 1967 and 1972, a crash program to improve the sewer system resulted in increasing the sewer output to $60 million/year. An accelerated sewer construction program was conceived in 1972, comprising $1.5 billion over the next 10 years. The key concept of the program was to proceed on entire drainage areas rather than on the piecemeal production of individual laterals to appease complaints on a given block. Recent financial difficulties, however, have at least temporarily stalled the program, with only about $10 million in funding going for sewer repairs. A breakdown of the city's sewerage needs is tabulated by individual boroughs. (Kreager-FIRL)
W77-00070

MAINE SEWER BID 39% BELOW ESTIMATE.
Engineering News-Record, Vol. 197, No. 7, p 45, August 12, 1976.

Descriptors: *Interceptor sewers, *Construction, *Hydraulic structures, *Pipelines, *Materials, Conveyance structures, Costs, Maine, Sewage, Municipal wastes.
Identifiers: *Portland(Me).

The construction of a proposed interceptor sewer for the city of Portland, Maine is discussed. The new interceptor will replace an existing brick sewer that discharges raw sewage into the Fore River and into Casco Bay. Work on the project includes the installation of about 5500 ft of 48-inch diameter reinforced concrete interceptor pipe along Portland's Commercial Street which runs adjacent to the river and bay. The pipeline will be installed in open trenches. Additionally, a 4500-foot long and 36-inch in diameter prestressed concrete force main will be constructed to carry the sewage from the interceptor to a new treatment plant. Overflow and diversion structures also will be built. About 400 ft of the new pipeline will be encased in concrete in areas where the interceptor will run under a series of railroad crossings. The lowest bidder for construction of the project dropped 39% below the consulting engineer's $3.9 million estimate. (Kreager-FIRL)
W77-00071

PLANNING AND CONSTRUCTION OF BIRMINGHAM'S MAIN OUTFALL SEWER,
Metropolitan Borough of Wolverhampton (England). Dept. of Technical Services.
M. V. King.
Chartered Municipal Engineer, Vol. 103, p 87-95, June, 1976. 5 fig, 4 tab, 2 ref.

Descriptors: *Sewers, *Waste water treatment, *Urban drainage, *Urban hydrology, Hydraulic structures, Conveyance structures, Costs, *Construction, *Design criteria.
Identifiers: *Birmingham(Gt. Brit).

The design and construction of a main outfall sewer for the city of Birmingham (Great Britain) is described. Design is based on conditions which will prevail after major redevelopment is completed in the area and accommodates a 5-year storm in the foul water system. Design involving the storm water system is for a 2-year interval storm. The setting of overflows is based on frequency of operation, with storm flows being evaluated for frequent storms. The route of the main outfall is designed to collect together as many sewers as possible for routing to the Minworth Sewage Works. The most difficult single problem encountered in the project involved connection to the Minworth carrier. Detailed maps of the city illustrate the location of the main outfall sewer, overflow, the Minworth carrier, and drainage patterns. Cost estimates for the construction of the drainage system are also presented. (Kreager-FIRL)
W77-00072

A RETROSPECTIVE ON THE STRUCTURAL STABILITY OF RCC SPUN SEWER PIPES,
National Water Authority of Jamaica (Kingston).
V. S. Chauhan.
Journal of the Institution of Engineers (India), Vol. 56, Pt. EN2, p 45-50, February, 1976. 6 fig, 2 tab, 6 ref.

Descriptors: *Sewers, *Pipelines, *Hydraulic structures, *Conduits, *Concrete pipes, *Structural stability, Repairing, Conveyance structures, Sanitary engineering, Materials.
Identifiers: *Reinforced cement concrete.

The structural stability of non-pressure cement concrete spun sewer pipes is discussed, with particular emphasis on determining the safe laying depth of such pipes. The supporting strength of a particular pipe classification is shown to be a function of the distribution of the vertical load, bedding conditions, and the lateral pressure which acts on the sides of the pipe. Data on the safe depth of earth cover and over-burden for various bedding conditions are tabulated according to pipe diameters ranging from 150-1800 mm. Methods for detecting and repairing structural deficiencies in spun sewer pipes are also briefly outlined. (Kreager-FIRL)
W77-00073

LARGE-DIAMETER CORRUGATED STEEL PIPE ENTERS STORM SEWER FIELD.
Water and Pollution Control, Vol. 114, No. 7, p 14-15, July, 1976.

Descriptors: *Sewers, *Steel pipes, *Storm drains, *Conduits, *Materials, Conveyance structures, Hydraulic structures, Pipes, Costs, Construction, Indiana.
Identifiers: Indianapolis(Ind).

The installation of 11-foot diameter, fully-lined corrugated steel pipe storm sewers via tunnelled construction is described as part of the Indianapolis, Indiana storm relief sewer project. The galvanized steel pipe which consists of 3 by 1 inch corrugations and spiral lockseam construction is first interior sprayed with bituminous material plus additives of asbestos and mica as a tack coating. This assures adherence of the finish coat, a centrifugally-spun liner of asphalt. Finally, asphalt is sprayed onto the pipe exterior for added corrosion resistance. Because of its comparatively light weight, the pipe can be winched into preplanned position. An 18-foot section weighs 7300 pounds as compared to 30,800 pounds for a 6-foot section of concrete pipe. Use of the 11-foot diameter steel pipe instead of 13-foot concrete pipe reduces the overall tunnel size to 13 ft, resulting in a savings of more than $100,000 in construction costs for a 1200-foot section. (Kreager-FIRL)
W77-00074

SEWER FORCE MAIN HELPS SOLVE POLLUTION PROBLEM.
Water and Sewage Works, Vol. 123 No. 7, p 48, July, 1976. 1 fig.

Descriptors: *Sewers, *Recreation facilities, *Conveyance structures, *Hydraulic structures, Construction, Materials, Pipelines, Alabama, Sewerage, Pipes, Concrete.
Identifiers: Mobile(Ala).

The use of a 48-inch prestressed sewer force main to help solve the pollution problem affecting a heavily used recreational area in Mobile, Alabama is described. The construction of the main is part of a plan to abandon an Eslava Creek treatment plant which discharges into the Dog River and pump to a McDuffie pollution control plant for effluent dispersal into the Mobile River. The force main which extends from a new Eslava Creek pumping station to the McDuffie pollution control plant includes 560 ft of 36-inch prestressed concrete pressure pipe and 26,400 ft of 48-inch prestressed pressure pipe. A blind cross at the McDuffie plant will permit future expansion of the line. A 1900-foot section of the 48-inch pipe was installed above ground on piers because of unstable soil conditions. Another section of the project called for 50 ft of tunneling under the Louisville and Nashville Railroad and 168 ft of tunneling under Interstate 10. (Kreager-FIRL)
W77-00075

KAMINISTIQUIA INTERCEPTOR SEWER COMPLETED IN THUNDER BAY.
Water and Pollution Control, Vol. 114, No. 7, p 42, July, 1976.

Descriptors: *Sewers, *Interceptor sewers, *Conveyance structures, *Hydraulic structures, Construction, Costs, *Canada, Sanitary engineering, Waste water treatment.
Identifiers: Ontario(Canada), Sanitary sewers, Thunder Bay(Ont).

Progress in a major sanitary trunk sewerage program for Thunder Bay, Ontario is described. A 14,000-foot Kaministiquia interceptor sewer tunnel was recently completed at a cost of $6.3 million. Mining operations on another part of the project, a 5800-foot Neebing/McIntyre interceptor, have also started and are averaging 450 ft a week. Work has also started on another portion of the in-

terceptor, a 48 by 65-inch diameter tunnel approximately 9000 ft in length. The total construction cost for the interceptor is $8.9 million. The construction work follows a detailed report which established the most economical means of bringing all sanitary sewage to a common treatment facility. (Kreager-FIRL)
W77-00076

PHYSICAL-CHEMICAL TREATMENT IMPROVES IRAN'S URBAN RUNOFF,
Tehran Univ. (Iran). Dept. of Environmental Health.
P. Samar, M. Sarai, N. Razeghi, G. Jamshidnia, and M. Hakimipour.
Water and Sewage Works, Vol. 123, No. 8, p 77-79, August, 1976. 4 fig, 2 tab, 8 ref.

Descriptors: *Urban runoff, *Waste water treatment, *Coagulation, *Adsorption, *Flocculation, *Sedimentation, Turbidity, Chemical oxygen demand, Lead, Heavy metals, Suspended solids, Separation techniques, Efficiencies, Performance, Activated carbon.
Identifiers: *Iran.

Environmental studies in Iran have revealed that a physical-chemical process consisting of coagulation, flocculation, sedimentation, and carbon adsorption is effective in treating urban land runoff. A system employing coagulation with alum, sedimentation, and adsorption with powdered activated carbon yielded average removal efficiencies of 97, 85, and 100% for turbidity, chemical oxygen demand, and lead, respectively. By comparing removal efficiencies in various stages of the treatment process, it was established that turbidity, chemical oxygen demand, and lead are mostly in the settleable and suspended solid forms. Consequently, coagulation, flocculation, and sedimentation result in high removals for these parameters. The optimum dosage of powdered activated carbon was chosen according to the adsorption efficiency of carbon for dissolved organics and averaged 58 milligrams/liter. (Kreager-FIRL)
W77-00077

URBAN STORMWATER DETENTION AND FLOW ATTENUATION,
H. G. Poertner.
Public Works, Vol. 107, No. 8, p 83-85, August, 1976.

Descriptors: *Urban runoff, *Storm water, *Detention reservoirs, *Cities, *Flow control, Rain, Design criteria, Recreation facilities, Surface waters.

Methods for achieving stormwater detention and flow attenuation in urban areas are discussed, with particular emphasis on detention ponds on earth surfaces, detention of rainfall on parking lots, and rainfall detention on rooftops. The following criteria for designing detention facilities are discussed: the prevention of excess stormwater buildup in habitable areas, the provision of a positive outlet for discharge of inflows when storage capacity is exceeded, the construction of sufficiet slopes for detention areas, the proper location of the deeper portions of storage areas, an evaluation of runoff that is likely to enter the storage site from upstream areas, the provision for uniform regulation of release flow rates, the planning of storage areas for more than one purpose, and the calculation of storage volume requirements. The development of storage ponds into recreational facilities is also discussed. (Kreager-FIRL)
W77-00078

AN OVERVIEW: SO YOU WANT TO RECYCLE YOUR WASTEWATER. HOW SHOULD YOU BEGIN. IS IT FEASIBLE,
G. R. Mace.
Industrial Water Engineering, Vol. 14, No. 2, p 24-26, April/May, 1976. 5 tab.

Descriptors: *Water reuse, *Waste water treatment, *Reclamation, *Industrial water, Cost-benefit analysis, Reclaimed water, Economics, Design criteria, Waste disposal, *Recycling.

A systematic approach for analyzing the economics of waste water disposal versus reuse is presented. The approach consists of four major steps: a detailed analysis of the effluent, a determination of the effect of recycle water on product quality, a survey of waste treatment operations available, and a total economic analysis. Cost data for a hypothetical problem involving the following three alternatives are presented: purchase and sewer disposal of 100% of the water, recycle of 50% and sewer disposal of 50% of the waste water, and recycle of 90% and river discharge of 10% of the waste water. The figures cited are intended only to demonstrate the results that can be derived from a well planned program of industrial plant design. (Kreager-FIRL)
W77-00079

DECREASE OF BACTERIAL CONTENT IN DIFFERENT TYPES OF STABILIZATION PONDS,
National Environmental Engineering Research Inst., Nagpur (India).
N. M. Parhad, and N. U. Rao.
Indian Journal of Environmental Health, Vol. 18, No. 1, p 33-46, 1976. 8 fig, 2 tab, 11 ref.

Descriptors: *Biological treatment, *Stabilization, *Ponds, *Bacteria, Coliforms, E. coli, Biochemical oxygen demand, Performance, Efficiencies, *Waste water treatment, Design criteria.
Identifiers: Enterococci.

Stabilization ponds at three different locations in Nagpur, India were studied to determine decreases in bacterial content. Samples were collected and analyzed for standard plate count, coliforms, E. coli, Enterococci, and biochemical oxygen demand. The pond showing the highest percentage reductions in both biochemical oxygen demand and indicator bacteria had a greater length of liquid travel and a higher initial organic concentration than the other two ponds. Its interconnecting arrangement which permitted surface overflow from one cell to the next, facilitating the transfer of a much larger algal population to the subsequent cell, also appeared responsible for its greater efficiency. The results of the study indicate that in addition to loading, detention period, and other design criteria such factors as the interconnecting arrangement between cells, the mode of operation, and the length of liquid travel also contribute to the bacterial removal efficiency of stabilization ponds. (Kreager-FIRL)
W77-00080

WASTEWATER TREATMENT BY REVERSE OSMOSIS,
Hitachi Ltd., Tokyo (Japan). Environmental Protection Systems Div.
A. Shimozato, S. Takahashi, Y. Koike, K. Ebara, and S. Komori.
Hitachi Review, Vol. 25, No. 4, p 147-152, 1976. 6 fig, 5 tab, 1 ref.

Descriptors: *Reverse osmosis, *Scaling, *Waste water treatment, *Water reuse, *Reclaimed water, Reclamation, Industrial wastes, Symbiosis, Membranes, Automation, Design criteria, Recycling, Cleaning, Evaporation, Electrodialysis.

Experiments dealing with membrane scale prevention during waste water treatment with reverse osmosis are reported. An automatic continuous ball cleaning system was developed which permits membrane cleaning during operation. The ball cleaning method involves passing sponge balls through the system for impact with the membrane and for promoting turbulent flow. Although adequate for the prevention of soft scale, it was found necessary to combine ball cleaning with chemical treatment for the prevention of hard scale. A combined chemical and ball cleaning system was operated continuously for 1500 hours and demonstrated both effectiveness and reliability. The application of reverse osmosis to closed system waste water treatment is illustrated for the electronics industry. The use of electrodialysis and evaporation in closed system treatment is also discussed. (Kreager-FIRL)
W77-00081

POLYMERS PLAY INCREASED ROLE IN WATER CLARIFICATION,
Calgon Corp., Pittsburgh, Pa.
J. J. Morrow.
Water and Sewage Works, Vol. 123, No. 7, p 78-81, July, 1976. 5 fig, 2 tab.

Descriptors: *Polymers, *Separation techniques, *Waste water treatment, *Coagulation, *Filtration, Ions, Municipal wastes, Industrial wastes, Performance, Economics, Suspended solids.
Identifiers: Synthetic organic polymers.

The use of synthetic organic polymers in operations involving solids/liquid separation is discussed. The applications of synthetic organic polymers range from the treatment of surface waters to the removal of suspended solids from the final clarifiers of municipal and industrial waste treatment plants. These polymers have also become instrumental in the development of new treatment applications such as direct filtration and high energy mixing. The high performance of synthetic organic polymers is attributed to their high molecular weights and the variety of electrically charged groups that can be placed along the polymer chain. Cationic polymers, for example, can be used in place of alum and lime for primary coagulation, with the result being a significant reduction in the volume and cost of treatment chemicals. Direct filtration with polymers is a treatment method being employed by an increasing number of municipal water systems. The polymers are applied as primary coagulant directly to the raw water source; after rapid mixing, the water is filtered without the benefits of flocculation and sedimentation. (Kreager-FIRL)
W77-00082

WASTEWATER OZONATION: A PROCESS WHOSE TIME HAS COME,
Union Carbide Corp., Tonawanda, N. Y.
H. M. Rosen.
Civil Engineering - ASCE, Vol. 46, No. 3, March 1976, p. 65-69. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Water quality, *Ozone, *Chlorine, *Effluents, *Chlorinated organic compounds, Legislation, Toxicity, Phenols, Oxidation.
Identifiers: Cyanide, Hypochlorides, Once through oxygen method, Oxygen recycle method, Once-through air method, *Ozonation.

Since 1903 ozone (O3) has been used as a polishing agent and disinfectant for potable water, but only recently has ozone been proposed for use as a cost effective way to achieve waste standards. Recently expanding interest is due to higher degree of treatment required by new pollution control laws, awareness of toxicity of chlorine (Cl), the Cl shortage in 1974, the trend toward reuse of treated waste water, technological advances in O3 research, understanding of O3 as a strong disinfectant and oxidant creating no secondary pollution problems, and the installation of oxygen activated sludge secondary treatment systems. O3 has a short half life, reverting quickly back to oxygen leaving nothing but dissolved oxygen in the treated waste water. Cl is toxic to aquatic life; forms chlorinated organic compounds at ppb concentrations which are not removed by traditional dechlorination practices. These non-biodegradable chlorinated organic compounds accumulate in the environment and in aquatic species. O3 may be

ore cost effective than Cl if there is concern for
hlorinated products in effluent, effluent toxicity,
r if the use of hypochlorites is required for safety.
ide benefits of O3 use include increased virus
emoval, reduced effluent color and/or turbidity,
dor and taste control, and effective removal of
henols and cyanides. There are 3 major O3 disin-
ectant processes. First, the once-through oxygen
ethod where dry oxygen is fed to the O3 genera-
r, the waste water disinfected and off-gas used
feed an oxygen activated sludge process after
estruction of unreacted O3. Second, the oxygen
ecycle method where off-gas is cleaned and dried
nd returned to the O3 generator. Thirdly, the
nce-through air method used when an oxygen ac-
vated sludge system is not in operation. (Gentry-
lorth Carolina)
W77-00099

THE ELIMINATION OF PHOSPHATES AND NITRATES FROM WASTE WATER BY ALGAL CULTURES: II. TERTIARY TREATMENT POTENTIAL OF ALGAE, (IN DUTCH),
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Anorganische Technische Chemie, Elektrotermie en Elektrochemie.
F. M. Bosch, H. Lootens, and E. Van Vaerenbergh.
Natuurwet Tijdschr. 56(1-4), p 3-16, 1974.

Descriptors: Phosphates, Nitrates, *Algae, Nutrients, Cultures, *Tertiary treatment, Farm wastes, *Waste water treatment, Dairy industry, *Scendesmus, *Chlamydomonas.

Two algal species (Scenedesmus and Chlamydomonas) were tested in order to evaluate the possibility of tertiary treatment of secondarily treated dairy waste water. The tertiary treatment potential was defined experimentally and using mathematical calculations. (See also W76-01312 and W77-00111)--Copyright 1975, Biological Abstracts, Inc.
W77-00110

THE ELIMINATION OF PHOSPHATES AND NITRATES FROM WASTE WATER BY ALGAL CULTURES. III, (IN DUTCH),
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Anorganische Technische Chemie, Elektrotermie en Elektrochemie.
F. M. Bosch, H. Lootens, and E. Van Vaerenbergh.
Natuurwet Tijdschr. 56(1-4), p 17-26, 1974.

Descriptors: *Phosphates, *Nitrates, Algae, Nutrients, Cultures, *Tertiary treatment, Farm wastes, *Waste water treatment, Filtration, Activated sludge, Microorganisms, Effluents, Dairy industry.

Tertiary treatment of dairy waste water was performed in 2 discontinuous algal cultures. The treatment efficiency of activated sludge microorganisms was compared with that obtained using a pure algal culture fed with effluent containing similar nutrient concentrations. The effect on tertiary treatment of an intermediate filtration was also investigated. (See also W76-01312 and W77-00110)--Copyright 1975, Biological Abstracts, Inc.
W77-00111

THE USE OF STOCHASTIC MODELS IN THE INTERPRETATION OF HISTORICAL DATA FROM SEWAGE TREATMENT PLANTS,
Wisconsin Univ., Madison.
P. M. Berthouex, W. G. Hunter, L. Pallesen, and C. Y. Shih.
Water Research, Vol. 10, No. 8, p 689-698, 1976. 6 fig, 5 tab, 3 ref.

Descriptors: *Sewage treatment, *Treatment facilities, *Methodology, *Time series analysis, Regression analysis, Efficiencies, Effluents, Biochemical oxygen demand, Mathematical models, Systems analysis, Stochastic processes, Suspended solids, Data collection, *Water pollution control.
Identifiers: Autoregressive models, Historical data.

Careful collection and examination of field data are essential if the dynamic performance of sewage treatment plants is to be understood. A 3-year historical record of sewage treatment plant performance has been evaluated graphically and with time series methodology. Models relating influent biochemical oxygen demand to effluent biochemical oxygen demand, mixed liquor suspended solids, temperature, an hydraulic detention time were constructed. Four possible definitions of plant efficiency were defined and studied as well. The use of efficiency rather than effluent BOD for modeling performance was not helpful. A logarithmic transformation of BOD seems to be a better metric than BOD itself. Studying historical records should lead to an improved understanding of plant dynamics. Time series methods seem to be one useful tool for this work. (Bell-Cornell)
W77-00121

EVALUATION OF PROPOSED MAN-MADE PONDS FOR FOOD PRODUCTION TO RECOVER VALUES IN WASTE HEAT AND SOLID ORGANIC SLUDGES,
Massachusetts Univ., Amherst. Water Resources Research Center.
J. W. Zahradnik, L. S. Turner, H. G. Levine, and C. Tucker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 773, Price codes: A04 in paper copy, A01 in microfiche. WRRC Publication No. 65, Completion Report FY-76-12, March 1976. 58 p, 14 fig, 3 tab, 22 ref, 4 append. OWRT A-079-MASS(1).

Descriptors: Aquaculture, Organic wastes, Feasibility studies, Effluents, Economic feasibility, Risks, Thermal pollution, *Nutrient requirements, *Sewage sludge, Public health, Ponds, *Waste water treatment.
Identifiers: *Thermal waste, Waste heat, Wastes recovery.

An analysis was conducted to determine: (1) the potential value of using, simultaneously, thermal effluents and sewage sludges in aquatic cultures; (2) the technical and economic feasibility of utilizing multilevel aquatic cultures in the recovery of these wastes; and (3) data voids and uncertainties which are of importance in implementation of the system designed. System inputs, potential system outputs and potential subsystem characteristics were characterized and documented through a literature survey. The alternative solutions were generated and evaluated on the basis of a matrix. Within the systems examined there appears a greater potential to utilize sludge than thermal discharges since a small fraction of the thermal effluents could be accommodated. Economic feasibility was not established. The data voids and uncertainties include the following: (1) kinetics of nutrient availability from sludge in aqueous media; (2) reliability of the subsystems in terms of disease control and invasion of undesirable species; (3) reconciliation of drastically different residence times between nutrient laden waters and thermally useful waters as they flow through subsystems; (4) evaluation of the consumable materials from public health and nuisance perspectives; and (5) effects of the subsystem on groundwater.
W77-00150

EVALUATION OF ACTIVATED SLUDGE CONTROL TECHNIQUES THROUGH PILOT PLANT AND COMPUTER ANALYSES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
R. E. Roper, Jr., and C. P. Leslie Grady, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 774, Price codes: A10 in paper copy, A01 in microfiche. Technical Report No. 77, June 1976. 192 p, 71 fig, 45 tab, 63 ref, 5 append. OWRT A-033-IND(1).

Descriptors: *Activated sludge, Biodegradation, Organic loading, Pilot plants, Control, *Waste water treatment, *Oxidation, Treatment facilities, Sludge treatment.
Identifiers: *Cell residence time, *Hydraulic control formula, Sludge age, Bio-oxidation, Sludge thickening.

An approach to activated sludge systems control was developed and experimentally verified in which the key parameter is the sludge age or mean cell residence time. Central to this approach is the use of a hydraulic control formula which can be applied to a wide variety of control situations and can be made plant specific by a simple calibration technique. To supplement the control formula a system descriptive operational diagram was developed which superimposes the predictions from current models for activated sludge bio-oxidation, sludge thickening and oxygen transfer. The diagram allows the operator to visualize the system constraints so that the need for a control action is obvious. The efficacy of the hydraulic control formula was evaluated through the use of two 850 gal/day activated sludge pilot plants. Analysis of the batch settling data indicated good promise for use in describing the sludge thickening constraints imposed on the system by the final settler.
W77-00157

TERTIARY TREATMENT AND REUSE OF ANIMAL WASTES,
Delaware Univ., Newark. Dept. of Agricultural Engineering.
W. F. Ritter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 768, Price codes: A03 in paper copy, A01 in microfiche. Completion Report (1976). 36 p, 1 fig, 17 tab, 20 ref. OWRT A-030-DEL(1), 14-31-0001-5008.

Descriptors: *Farm wastes, Nitrogen, Phosphorus, Chemical oxygen demand, Denitrification, *Tertiary treatment, *Waste water treatment, Water reuse, Recycling, Waste disposal.

Two barriered landscape water renovation systems (BLWRS) were operated for nearly two years. The first BLWRS (BLWRS-1) was constructed from a silt loam soil and the second (BLWRS-2) was constructed from a sandy loam soil. Liquid dairy waste was applied to BLWRS-1 at a loading rate of 0.84 cm/day and to BLWRS-2 at loading rates of 0.84-2.45 cm/day. The high loading rate of 2.45 cm/day was only maintained for 47 days because of ponding on the BLWRS surface. The average COD removal rate was 95% for BLWRS-1 and 98% for BLWRS-2, while the nitrogen removal for BLWRS-1 and BLWRS-2 was 87 and 91%, respectively. Both BLWRS removed over 99% of the phosphorus. The treatment efficiency did not change with loading rate or there was no significant change in effluent quality during the different seasons of the year. Besides removing COD, nitrogen, and phosphorus, the BLWRS will remove significant amounts of potassium, sodium, aluminum and zinc from liquid dairy manure. The results also indicate that a BLWRS cannot be operated for the entire winter in the Mid Atlantic States. The estimated annual cost for a waste handling system for a 100 free-stall dairy herd using recycled effluent in a flushing system with a lagoon and BLWRS would be $7717. The waste handling system using a BLWRS was estimated to be more expensive than four other systems. The BLWRS might have more potential as a tertiary treatment method for motels and campgrounds than for a dairy farm. The greatest potential for using a BLWRS in the livestock industry would probably be with milking center wastes.

W77-00158

BIOLOGICAL PURIFICATION OF THE IZMAIL BOARD MILL EFFLUENTS (BIOLOGICHESKAYA OCHISTKA STOCHNYKH VOD IZMAIL'SKOGO TSELLYULOZNO-KARTONNOGO KOMBINATA),
E. Kh. Gerts.
Biokhimicheskaya Ochistka Stochnykh Vod, Materialy Respublikanskoi Konferentsii, Vol. 1, p 18-19, 1972, Published 1976.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Wastes, *Industrial wastes, Waste treatment, Water pollution sources, Pulp and paper industry, Biochemical oxygen demand, Hydrogen ion concentration, Municipal wastes, Canneries, Suspended solids, Foreign countries, Water pollution treatment, Treatment facilities.
Identifiers: Kraft mills, *USSR.

The overall effluent from the Izmail mill which manufactures kraft pulp has a COD (permanganate) of 271.6-354.2 mg/liter or (dichromate) 939-1280 mg/liter, a 5-day BOD of 177.8-226.6 mg/liter, and a pH of 7.2-10.5. Biochemical purification equipment of 20,000 cu m/day capacity, installed in 1965, reduced the COD by 33-61% and the BOD by 63-78.8%. In 1968 the capacity of the equipment was increased to 41,100 cu m/day, and the joint purification of the mill effluents, municipal sewage, and effluents from a canning plant was introduced. Because of the composition of the municipal and canning wastes, the effectiveness of purification was increased to 57.4-62.6% for COD and to 92.6-93.0% for BOD. There was also a nearly 94% reduction of suspended solids. (Stapinski-IPC)
W77-00322

DIMINUTION OF SUSPENDED SOLIDS IN PULP AND PAPER INDUSTRY EFFLUENTS BY TREATMENT WITH CHEMICAL COAGULANTS (DIMINUAREA CONTINUTULUI DE SUSPENSII TOTALE IN APELE REZIDUALE DIN INDUSTRIA CELULOZEI SI HIRTIEI, PRIN TRATAREA CU AGENTI CHIMICI COAGULANTI),
E. Strugariu.
Celuloza si Hirtie, Vol. 25, No. 1, p 27-34, January/March, 1976. 10 fig, 3 tab, 10 ref.

Descriptors: *Pulp wastes, *Suspended solids, *Waste water treatment, *Coagulation, Wastes, *Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Lime, Silica, Bentonite, Clays, Flocculation, Water purification, Chemical precipitation.
Identifiers: Aluminum sulfate, Sodium aluminate, Iron sulfate, Sodium silicate, Carboxymethylcellulose, Polyamine-polyamide-epichlorohydrin condensates, Polyacrylamide.

After a review of the mechanism of action of coagulants, laboratory experiments are reported on the removal of suspended solids from kraft pulp and paper mill effluents by treatment with several coagulants (with or without addition of flocculating aids). Chemicals added to the waste water included aluminum sulfate, lime, sodium aluminate, ferrous sulfate, activated silica, sodium silicate, sodium carboxymethylcellulose, polyamine-polyamide- epichlorohydrin condensate, hydrolyzed polyacrylamide, and bentonite. Only four of these gave good results, namely, sodium aluminate, lime, aluminum sulfate, and activated silica. In optimum doses of 700, 400, 200, and 30 mg/liter, respectively, they achieved a suspended solids reduction to less than 100 mg/liter. Adding lime or bentonite as flocculant aids did not stimulate the coagulating effect of aluminum sulfate. (Brown-IPC)
W77-00323

HYDROLYSIS OF PRESS WASTE WATERS FROM THE MANUFACTURE OF FIBER (INSULATION) BOARDS (CONTRIBUTII LA STUDIUL PROCESULUI DE HIDROLIZA A APELOR DE PRESA DIN CIRCUITUL DE FABRICATIE AL P.F.L.),
R. Butnaru, M. Sirbu, and S. Petrovan.
Celuloza si Hirti, Vol. 25, No. 1, p 11-17, January/March, 1976. 14 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Hydrolysis, *Carbohydrates, Wastes, Waste treatment, Water pollution sources, Water pollution treatment, *Wood wastes, Temperature, Hydrogen ion concentration, Acidity, Corrosion, Chemical degradation, Water pollution control, Waste dilution.
Identifiers: *Insulation boards, Wood particle boards, Sugars, Wood, Defibration.

Waste waters from the defibration of wood (or wood wastes) and the platen pressing of wood-fiber or wood-particle boards contain about 20-30 g/liter of carbohydrates. The effects of hydrolysis parameters on sugar yield were investigated. Reaction time and temperature were found to have a more pronounced effect than did pH and dilution ratio. Maximum sugar yield was obtained after about 2 hr (118 min), minimum yield at 115C; above this temperature, the yield increased. The greatest yield increase was observed between pH 0.5 and 1.0, but since this acidity poses corrosion problems, it is recommended to conduct commercial hydrolyses at pH 1.5-1.75. (Brown-IPC)
W77-00324

CHEMICAL-TECHNOLOGICAL CONTROL OF (EFFLUENT) PURIFICATION EQUIPMENT (KHIMIKO-TEKHNOLOGICHESKII KONTROL' NA OCHISTNYKH SOORUZHENIYAKH),
Ivdelskii Gidroliznyi Zavod (USSR).
B. N. Egorov, and I. V. Zakharenko.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 3, p 20-22, 1976.

Descriptors: *Fermentation, *Hydrolysis, *Waste water treatment, *Treatment facilities, Operation and maintenance, Foreign countries, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Biochemical oxygen demand, Hydrogen ion concentration, Neutralization, Lime, Suspended solids, Sedimentation, Aeration, Temperature, Phosphorus compounds, Nitrogen compounds, Water pollution treatment, Sands, Oxidation, Wood wastes.
Identifiers: USSR.

The 5-day BOD of wood-hydrolysis and fermentation plant effluents is 1200-1500 mg/liter, depending on their dilution, and their pH is 5-5.5. The effluents are purified by neutralization with lime, separation of sand and other heavy particles, removal of suspended solids by sedimentation, and biochemical oxidation in aeration tanks. In this article, a description is given of the purification equipment at the Ivdel' fermentation plant (U.S.S.R.) and the control of its operation, which consists in daily determinations of 5-day BOD, permanganate oxidizability, suspended solids, and reducing substances, and additional determinations, each month, of temperature and nitrogen and phosphorus contents of the effluents. Because of its insufficient capacity, the equipment will be modernized to achieve a 5-day BOD after purification of 19 mg/liter. (Stapinski-IPC)
W77-00327

BIODEGRADABILITY OF PHENOLIC COMPOUNDS (BIODEGRADABILITA DI COMPOSTI FENOLICI),
P. Maggio, L. D. Angiuro, and B. Focher.
Industria della Carta, Vol. 14, No. 3, p 105-111, March, 1976. 7 fig, 2 tab, 24 ref.

Descriptors: *Phenols, *Pulp wastes, *Biodegradation, *Microorganisms, Wastes, Water pollution sources, Microbial degradation, Water pollution treatment, Water pollution control, Industrial wastes, Aromatic compounds, Organic compounds.

The influence of inoculum types on the biodegradability of phenolic compounds such as occur in pulp mill effluents was evaluated. It was found that the most rapid rate of biodegradation was obtained with an inoculum specially selected for the phenol involved. (Speckhard-IPC)
W77-00328

WASTE WATER TREATMENT AT SCP (SEMICHEMICAL PULP), CGP (CHEMIGROUNDWOOD PULP) MILLS,
Daishowa Paper Mfg. Co., Ltd., Fuji (Japan).
I. Ogiya.
Japan Pulp and Paper, Vol. 13, No. 4, p 45-52, December, 1975. 8 fig, 11 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Foreign countries, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Oxidation, *Chemical oxygen demand, Water pollution control, Coagulation, Sedimentation, Activated sludge.
Identifiers: *Japan, Chemical recovery, Aluminum sulfate, *Semichemical pulp mills, Chemigroundwood mills.

Effluent treatment at semichemical pulp mills is discussed with emphasis on COD reduction. The following chemical recovery processes used at Japanese semichemical pulp mills are briefly described, including the ESI direct oxidation method (developed jointly by Ebara Manufacturing Co. Ltd. and Saga Paperboard Co.), the SCA-Billerud process (developed by Svenska Cellulosa AB. jointly with Billerud AB. of Sweden), Tampella process (Tampella AB./Oy. of Finland) and the RAS (recovery process by air oxidation of sodium sulfide) process developed by Mitsubishi Heavy Industries Ltd. of Japan. Flow diagrams are given for each process, and the important chemical reactions in each are discussed. Treatment of the waste water after chemical recovery to further reduce COD is discussed. Experimental data show that coagulation-sedimentation with alum reduces the COD by 36-38%, while activated sludge treatment reduces COD by about 30%. With electrolytic coagulation, COD reduction is approximately 60%. Electrolytic coagulation followed by activated sludge treatment reduced COD by 80%. (Witt-IPC)
W77-00329

BLEACHABILITY OF SOFTWOOD AND HARDWOOD KRAFT PULPS IN OZONE BLEACHING (IN JAPANESE),
Government Industrial Research Inst., Takamatsu (Japan).
H. Kamishima, T. Fujii, and I. Akamatsu.
Japan Tappi, Vol. 30, No. 7, p 381-391, July, 1976. 13 fig, 6 tab, 12 ref.

Descriptors: *Bleaching wastes, *Ozone, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Chemical oxygen demand, Biochemical oxygen demand, Activated sludge, *Pulp wastes, Pine trees, Deciduous trees, Coniferous trees, Chlorine, Effluents.
Identifiers: Beech trees(Fagus), Kraft mills.

Pine and beech kraft pulps of comparable unbleached brightness were treated with ozone. The ozone bleaching waste waters (from pulps above 72% brightness) contained a COD(Mn) pollution load of 30-50 g/kg of pulp; the BOD/COD(Mn) ratio was 0.6-0.8, with higher values for beech- than pine-derived effluent. Acuvated sludge treatment of the ozone bleaching wastes achieved a higher COD reduction than for spent alkaline ex-

raction wastes from chlorine bleach plants; the COD reduction was greater for beech- than for pine-derived effluents. (Brown-IPC)
W77-00330

STATUS REPORT ON ABATEMENT OF EFFLUENTS FROM THE CANADIAN PULP AND PAPER INDUSTRY -- 1974.
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W77-00331

COLOR REMOVAL FROM SOFTWOOD KRAFT CAUSTIC EXTRACT EFFLUENT BY POLYAMINES,
Institute of Paper Chemistry, Appleton, Wis.
T. C. Kisla.
Ph.D. Thesis, 1976, 110 p. 28 fig, 48 ref, 20 tab.

Descriptors: *Bleaching wastes, *Color, *Waste water treatment, *Chemical precipitation, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Effluents, Softwood, Water pollution control, Pulp wastes, Pulp and paper industry.
Identifiers: *Polyamines, *Amines, Polyethylenimine, Ethylenediamine, 1,12-Diaminododecane, Kraft mills, Diethylenetetramine, Triethylenetetramine.

Polyamines were evaluated for their ability to remove color from the alkaline extraction effluent of a kraft mill bleach plant, and from a reconstituted acid-insoluble fraction of the effluent. Polyethylenimine 18 (having a molecular weight of 1800) removed 85-90% of the color from the effluent in the pH range 7-8.5. Linear polyamines (e.g., di- and triethylenetetramine, ethylenediamine) were less effective for color removal, but they were most effective in acidic conditions. Ethylenediamine and 1,12-diaminododecane removed some color from the effluent, but the other diamines tested did not. A general mechanism of color removal by polyamines is proposed. (Buchanan-IPC)
W77-00335

SORPTION ON ACTIVATED CARBON OF IMPURITIES OF TEXTILE INDUSTRY EFFLUENTS (SORPCJA ZANIECZYSZCZEN ZE SCIEKOW PRZEMYSLU WLOKIENNICZEGO NA WEGLU AKTYWNYM),
Centralne Laboratorium Dziewiarstwa (Poland).
J. Rouba.
Przeglad Wlokienniczy Vol. 30, No. 4, p 217-220, April, 1976. 3 fig, 4 tab, 5 ref.

Descriptors: *Textiles, *Waste water treatment, *Activated carbon, *Sorption, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution control, Odor, Hydrogen ion concentration, Color, Turbidity, Foaming, Chlorides, Sulfates, Iron, Manganese, Organic compounds, Oil, Lipids, Water purification, Economics, Water pollution sources, Cotton, Fabrics, Filters, Sands, Coagulation, Oxidation, Recycling, Water reuse.
Identifiers: Synthetic fabrics, Regenerated cellulose.

Effluents from the production of cotton and cotton-synthetic and -regenerated fiber fabrics purified by coagulation, and effluents from the production of regenerated cellulose and synthetic fiber fabrics purified on sand filters, were subjected to additional purification by sorption on granulated activated carbon in a three-column reactor. The effectiveness of the purification was evaluated by determinations of odor, pH, color, turbidity, oxidizability, foam formation, and the contents of chlorides, sulfates, iron, manganese, and organic substances (fats and oils). The results indicate that this method of additional purification is not only effective in removing impurities but also presents the possibility of achieving a closed cycle of process water. The flexibility of the sorption process makes it possible to control the degree of purification desired. However, this method is economically justified only when applied to effluents that have been purified chemically or biologically or to effluents with a low concentration of impurities, such as wash waters. (Stapinski-IPC)
W77-00339

PAPER CHEMICAL RECLAMATION AND REUSE VIA REVERSE OSMOSIS,
B. Brown, B. Crouse, D. Etter, and W. Schattner.
Research Disclosure, No. 142, p 46, February, 1976. 1 fig.

Descriptors: *Reverse osmosis, *Waste water treatment, *Water reuse, Wastes, Industrial wastes, Water pollution treatment, Waste treatment, Water pollution control, Separation techniques, Membrane processes, Fibers(Plant), Filtration, Water conservation, Industrial water, *Patents, Recycling.
Identifiers: *White water(Paper machines).

A reverse osmosis system is described for concentrating white water from a paper machine, the white water having been previously freed of its fiber content through treatment in a filter or decanter. The reverse osmosis unit separates the fiber-free white water into a concentrate of pulp additives (e.g., wet- and dry-strength agents) and a permeate (a form of deionized water). Both the concentrate and the permeate can be recycled in the papermaking process, making it possible to operate the mill on a closed-water system basis. (Speckhard-IPC)
W77-00340

SECONDARY DEGRADATION OF SULFITE MILL WASTE WATER BY DEVELOPMENT OF ALGAL MASSES (SEKUNDAERABBAU VON SULFITZELLSTOFFABWASSER DURCH ALGEN-MASSENENTWICKLUNGEN),
G. Otto.
Zellstoff und Papier, Vol. 25, No. 6, p 170-173, June, 1976. 3 fig, 1 tab, 8 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Algae, *Waste water treatment, *Lignins, *Degradation(Decomposition), Oxidation, Color, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Water pollution treatment, Effluents, Aquatic algae, Biodegradation.
Identifiers: Lignosulfonic acids.

The oxidation processes during the secondary degradation of biochemically pretreated sulfite pulp mill effluents are considerably accelerated in the presence of unicellular green algae. Color elimination of about 98% occurs in 100 days. This effect is attributed primarily to the oxidation of lignosulfonic acids by nascent oxygen arising from algal photosynthetic activity. (Ward-IPC)
W77-00341

PROCESS FOR PURIFYING INDUSTRIAL WASTE WATERS (PROCEDE D'EPURATION D'EAUX USEES INDUSTRIELLES).
CIBA-GEIGY Ltd., Basel (Switzerland).
French Patent No. 2,189,327. January 25, 1974, 18 p, 7 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp wastes, *Textiles, *Dyes, *Patents, *Flocculation, Wastes, Water pollution sources, Waste treatment, Water purification, Anions, Ureas, Water pollution treatment, Water pollution control, Color, Flocculation, Chemical precipitation.
Identifiers: *Leather, Formaldehyde, Optical brighteners, Dicyandiamide.

A process for decoloring waste waters coming from the textile, paper, or leather industries or from the manufacture of water-soluble anionic dyes or optical (fluorescent) brighteners is characterized by the addition of a water-soluble condensation product of formaldehyde (e.g., with dicyandiamide or urea) and elimination of the resulting flocculated material. (Speckhard-IPC)
W77-00342

PROCESS FOR TREATING WASTE WATER (VERFAHREN ZUR BEHANDLUNG VON ABWASSER),
SCA Development A.B. (Sweden).
A. H. Karlsson.
German Patent (Offenlegungsschrift) No. 2,521,893. November 20, 1975, 8 p, 1 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Oxidation, *Patents, Pulp wastes, Neutralization, Organic compounds, Metals, Iron, Iron compounds, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Oxidation-reduction potential.
Identifiers: Hydrogen peroxide, Iron sulfate.

An oxidation process for partially or completely neutralizing organic materials in the effluent from a pulp mill (especially bleaching effluent) involves at least partial oxidation of the materials with hydrogen peroxide in the presence of a metal which can occur in at least two oxidation stages (e.g., iron), the metal being added in its lowest oxidation state (e.g., as ferrous sulfate). (Speckhard-IPC)
W77-00343

SANITARY-BACTERIOLOGICAL EVALUATION OF THE METHOD OF TREATMENT AT A SMALL SEWAGE PLANT, (IN RUSSIAN),
B. G. Vodop'Yan, Y. P. Zhil'Tsov, S. P. Shchennikov, and T. F. Kuznetsova.
Gig Sanit 4, p 95-97, 1975.

Descriptors: *Sewage treatment, *Waste water treatment, *Aeration, *Oxidation lagoons, Settling basins, Filters, Filtration, Chlorination, Pathogenic bacteria, Activated sludge, Microorganisms.
Identifiers: Salmonella-typhimurium, Sand filters, Sand filtration.

Sewage treated in aeration tanks and settling basins required additional treatment in sand filters, filter beds and biological oxidation ponds. Sand filtration and subsequent chlorination eliminates the entry of pathogenic microorganisms (e.g., Salmonella typhimurium) into a water body. Treatment of excess activated sludge in aerobic stabilizers is highly effective in a bacteriological respect and is recommended for wide use.--Copyright 1976, Biological Abstracts, Inc.
W77-00350

EFFECTIVENESS OF WASTEWATER TREATMENT AT THE SHOSTKA 50TH ANNIVERSARY OF THE USSR CHEMICAL PLANT, (IN RUSSIAN),
A. A. Ipatova, S. S. Badyva, N. Y. Biryukova, and V. M. Nefedchenkov.
Gig Sanit 4, p 101-102.

Descriptors: *Waste water treatment, *Chemical wastes, Industrial wastes, Recycling, Reuse, Aeration, Oxidation lagoons.
Identifiers: *Shostka River, *USSR, *Photography chemical wastes.

The sanitary characteristics of the Shostka River before and after treatment of the wastewaters of the Shostka photographic chemical plant are described. A water-recycling system returns more than 90% of the water for reuse. Aeration tanks have improved the sanitary condition of the river

below the effluent outlet.–Copyright 1976, Biological Abstracts, Inc.
W77-00351

NEW METHOD OF SEWAGE SLUDGE DECONTAMINATION, (IN RUSSIAN),
All-Union Scientific Research Inst. of Medical Parasitology and Tropical Diseases, Moscow (USSR).
V. Y. Kebina, R. Y. Agranonik, and N. A. Romanenko.
Gig Sanit 4, p 102-103, 1975.

Descriptors: Sewage sludge, *Sewage treatment, *Sludge treatment, *Waste water treatment, Soils, *Centrifugation, Dewatering, Heat treatment, Fertilizers, Separation techniques.

Sewage sludge is preliminarily centrifuged at a dilution factor of more than 1000; the centrifugate is put into the soil by a hydraulic borer and the dehydrated sludge is heat-treated and used as fertilizer.–Copyright 1976, Biological Abstracts, Inc.
W77-00352

BASF COMPLETES TEN-YEAR PROJECT FOR CLEANING UP THE RHINE,
Water Services, Vol. 79, No. 958, p. 507-508, 1975.

Descriptors: *Sewage treatment, *Industrial wastes, *Domestic wastes, Treatment facilities, Separated sewers, Interceptor sewers, Cost repayment, Landfills, Landscaping, Sludge treatment, Europe, Pollution abatement.
Identifiers: *Combined waste treatment, Badische Anilin- and Soda-Fabrik, *Rhine River(Germany), Ludwigshafen(Germany), Frankenthal(Germany).

Badische Anilin- and Soda-Fabrik at Ludwigshafen, Germany, has completed a waste treatment plant covering 86 acres. The facility also treats the sewage of the cities of Ludwigshafen and Frankenthal. The investment represents 200 million deutsche marks, with operating costs of DM 70 million annually. The effluent from BASF and Ludwigshafen totals approximately 185 mgd and is collected in an interceptor sewer where it is neutralized. After r emoval of coarse solids, the waste water is pumped through pressure mains; the Frankenthal sewage is then added and filtered; then directed to primary sedimentation tanks, then to aeration basins. BOD is reduced 95%, COD and TOD are reduced 75%; 70-100 ppm nitrates are removed by the biological system. The concentrated sludge is treated with ash recycled from the sludge incineration process. The waste gases from sludge incineration are cleaned in electrostatic precipitators. Ludwigshafen pays for the cost of its sewage treatment based on the BOD load. The final, clarifed effluent (restricted to 20/30 ppm BOD, 20/40 ppm SS, and a temperature not to exceed 30C) is released to the Rhine River. Solid wastes are landfilled on a 198-acre island site by a process developed by BASF. The various treatment procedures are described. (Auen-Wisconsin).
W77-00403

EFFECT OF SPRINKLING PASTURES WITH POTATO STARCH FACTORY WASTE EFFLUENTS ON QUALITY OF RAW MILK, AND DEVELOPMENT OF A PROCESS FOR REMOVAL OF PROTEIN, AMINO ACIDS AND POTASSIUM FROM WASTES. (IN JAPANESE)
Obihiro Zootechnical Univ. (Japan). Lab. of Chemical Technology Milk Products.
K. Sukegawa, H. Ariga, S. K. Takahashi, K. Matsumura, and S. Tanabe.
Res Bull Obihiro Univ Ser I. 9(2), p 273-286, 1975.

Descriptors: *Effluents, Wastes, Water pollution sources, *Industrial wastes, Waste water disposal, *Milk, Potatoes, Nitrogen, Potassium, E. coli, *Bacteria, Magnesium, Phosphorus, Salmonella, *Disinfection, Waste water treatment.
Identifiers: Amino-Acids, *Cows, Escherichia-Coli, Staphylococcus, Starch, *Bacteria removal processes.

Milk from cows which ate pasture sprinkled with waste effluents from a potato starch factor was studied. The best method for removing N compounds and K from the wastes was determined. Wastes containing high ratios of various elements were decanted. Concentrations of N, K and P were about 2000, 2800 and 300 ppm, respectively. The bacteria in the wastes were mostly common bacteria (105-108/ml) and Escherichia coli groups (10-106/ml). Salmonella and Staphylococcus were also present. Most of these bacteria came from the soil. The growth and yeild of grass sprinkled with wastes were very good, although unusual amounts of nitrate, K and P accumulated in the grass. No statistically significant differences were recognizable in milk composition from cows which grazed either the experimental or control pastures. In the sprinkled pasture the P content in the milk was slightly higher than normal and the Mg content in the milk slightly lower, although these values were not abnormal. Only slight traces of nitrate and nitrite were detectable in the milk from both pastures. Of the N compounds in the decanted wastes, 40-45% were removed by heat (70 C); 25% of the waste N content could be decreased by this method. About 80% of non-protein N and 95% of the K were removed from the decanted wastes by ion-exchange.–Copyright 1976, Biological Abstracts, Inc.
W77-00420

THE COST OF PHYSICAL CHEMICAL TREATMENT (PCT) WASTE WATER,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
S. Y. Ip.
Water (Journal of the Australian Water and Wastewater Association) Vol. 3, No. 1, p 11-13, March 1976. 1 tab, 1 fig, 9 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Operating costs, *Australia, *Cost comparisons, Recycling, Phosphorus, Filtration, Chlorination, Dewatering.
Identifiers: *Physical chemical treatment, Clarification, Recalcination, Recarbonation, Ammonia stripping.

A series of estimated Australian costs is presented stage by stage for plants with operating capacities of 0.1 1.0 and 10 mgd, in order to allow comparison of costs between recycling treated industrial effluent and the purchase and disposal of water via sewers. Processes included are: Phosphorus removal with or without recalcination, lime mud dewatering and recalcination, ammonia stripping, recarbonation and clarification, filtration, chlorination, and an activated carbon column. (CSIRO)
W77-00445

GS/MS (GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC) ANALYSES OF ORGANIC COMPOUNDS IN TREATED KRAFT PAPER MILL WASTEWATERS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-00456

CENTRIFUGE PLUS LIME LIMITS LIGNIN IN WASTE WATER,
R. Moll.
Southern Pulp and Paper Manufacturer, Vol. 39, No. 6, p 14-15, June, 1976. 1 fig, 3 illus, 1 tab.

Descriptors: *Pulp wastes, *Lignins, *Lime, *Chemical precipitation, *Waste water treatment, *Centrifugation, Wastes, Industrial wastes, Waste treatment, Color, Sludge treatment, Burning, Water purification, Costs, Pulp and paper ind try, Water pollution sources, Water polluti treatment, Water pollution control, Treatm facilities, *Louisiana.
Identifiers: Clarifiers, Centrifuges.

Lignin is removed from the effluent of Continen Can Company's kraft mill at Hodge, Louisiana, adding lime and allowing the color bodies precipitate with the fiber fines in a clarifier. T sludge is removed and centrifuged in a model 5400 Super-D-Canter centrifuge. Dry cake tracted by the centrifuge is delivered to the li kiln for burning, together with the caustic mud tracted by vacuum filters. The solids content the centrifuge cake varies from 30 to 40%. T centrifuge removes 83.3% of the solids coming The cost of the entire waste treatment syste which includes all direct costs, as well as engine ing time and supervision costs, was $2,300,0 The system treats 9,000,000 gallons of fluent/day, equivalent to a paper production r of 750 tons/day. (Witt-IPC)
W77-00464

SPENT SEMICHEMICAL PULPING LIQUOR (V). IMPROVEMENT OF COLOR-REMOVA EFFICIENCY BY PHOTOCHEMICAL TREA MENT (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan).
S. Meguro, K. Sameshima, M. Sumimoto, and T Kondo.
Japan Tappi, Vol. 30, No. 8, p 444-449, Augu 1976. 6 fig, 1 tab, 8 ref.

Descriptors: *Sulfite liquors, *Pulp wast *Color, *Waste water treatment, *Ultra-vio radiation, Wastes, Industrial wastes, Waste tre ment, Water pollution sources, Radiation, Wa pollution control, Water pollution treatment, ganic compounds, Oxygenation, Hydrogen concentration, Temperature, Chemical oxygen mand, Aeration, Pollution abatement, Irradiatio
Identifiers: Rose bengal, Periodates, Ace acetone, Hydrogen peroxide, Photochemist *Photochemical treatment.

Earlier work proved that various kinds of sp pulping liquors could be decolored by fairly lo irradiation with high-pressure UV lamps. Furth studies concentrated on shortening the irradiati of spent neutral sulfite semichemical liquor c taining 250 ppm of organic matter which had th far defied effective decolorization. Among fluential factors examined (oxygenation, air bu bling, pH, temperature), oxygen bubbling was most effective. It accelerated the photo-induc decoloring rate in both alkaline and acid med The effect increased at elevated temperature. T best decoloration (90%) and a 40% COD decrea were achieved at pH 12 and 60C upon irradiati plus oxygen bubbling for about 2 hr. Seve chemical additives were tried during room-te perature irradiation for 1.5 hr (alkaline) or 2.5 (acidic). The best result (about 90% color remov was obtained with 25 ppm of rose bengal a periodate at pH 12 or 5, or with acetyl acetone a hydrogen peroxide at pH 5. Lower amounts rose bengal sufficed at pH 5 to attain significa decoloring effects. (Brown-IPC)
W77-00465

EFFLUENT-FREE BLEACHED KRAFT PU MILL. PART VII. SODIUM CHLORIDE IN A KALINE PULPING AND CHEMICA RECOVERY,
Erco Envirotech Ltd., Islington (Ontario).
For primary bibliographic entry see Field 3E.
W77-00466

WATER QUALITY ASPECTS OF WEL RECHARGE WITH RECLAIMED WATER, BA PARK, NEW YORK,
Geological Survey, Albany, N.Y.
J. Vecchioli.

n: Biological Control of Water Pollution; roceedings of the International Conference on iological Water Quality Alternatives, March 3-5, 975, University of Pennsylvania, Philadelphia, ennsylvania: American Society of Civil En-ineers, p 295-299, 1976. 1 fig, 1 tab, 4 ref.

escriptors: *Water reuse, *Injection wells, Artificial recharge, *Water quality, *New York, quifers, Reclaimed water, Water treatment, ewage treatment, Tertiary treatment, Chemical eactions, Water chemistry, Chemical analysis, Vaste water treatment.
dentifiers: Bay Park(NY), *Long Island(NY), lagothy aquifer(NY).

rom 1968 to 1973, water reclaimed from sewage as used in a series of deep-well artificial-echarge experiments at Bay Park, N. Y., by the J. S. Geological Survey in cooperation with the lassau County Department of Public Works. This aper summarizes water-quality aspects of the echarge tests. Microbial growth around the well creen caused significant well clogging when nchlorinated water was injected. The higher filter fficiency of the fine to medium sand of the quifer restricted movement of bacteria away rom the point of injection. In tests in which hlorinated water was recharged, clogging by icrobial growth was insignificant. However, henever there was an appreciable pause between he end of injection and the start of repumping, the irst water repumped had a strong sulfide odor, as highly turbid, and was laden with bacteria. Chemical quality of the reclaimed water was odified by interaction with the aquifer. Iron con-entration of the mixed native and reclaimed aters increased to as much as 3 milligrams per ter from background levels of a few tenths in ach; pH decreased to a low of about 4.5 from evels of about 5.5 for native water and 6.1 for eclaimed water. Residual phosphorus was emoved almost completely, but nitrogen uptake y the aquifer was minimal. (Woodard-USGS)
W77-00492

5E. Ultimate Disposal Of Wastes

ENVIRONMENTAL IMPACT OF CADMIUM AND OTHER HEAVY METALS FROM LAND-APPLIED SEWAGE SLUDGE,
Visconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W77-00002

PROCEEDINGS OF THE 1975 NATIONAL CONFERENCE ON MUNICIPAL SLUDGE MANAGEMENT AND DISPOSAL.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5D.
W77-00009

REGIONAL WASTEWATER SOLIDS MANAGEMENT PROGRAM LOS ANGELES-ORANGE COUNTY METROPOLITAN AREA,
Los Angeles-Orange County Sludge Program, Whittier, Calif.
D. Burack.
n: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 26-29. fig.

Descriptors: *Sludge disposal, *Sludge treatment, Recycling, *Programs, *Governmental interrelations, Waste disposal, Reclamation, Incineration, Dewatering, Byproducts, Solid wastes, Municipal wastes, California, Industrial wastes, Transportation, California.
dentifiers: Pyrolysis, Los Angeles(Calif), Orange County(Calif).

A regional waste water sludge management program for the Los Angeles-Orange County metropolitan area is described. The program is to be conducted under a Joint Powers Agreement by the three major waste water agencies in the region with the assistance of the State of California and the United States Environmental Protection Agency. The following disposal or recycling alternatives will be studied: recycling of waste water solids for agricultural uses, soil reclamation, and use as soil supplement; disposal of waste water solids to land; waste water solids disposal to the ocean; incineration and pyrolysis processes for volume reduction and resource recovery; and conditioning, dewatering, and composting. In conjunction with these alternatives, transportation and sludge processing as well as the disposal of industrial sludges will also be studied. (See also W77-00009) (Kreager-FIRL)
W77-00011

URBAN SLUDGE DISPOSAL OR UTILIZATION ALTERNATIVES, SOCIO-ECONOMIC FACTORS,
Environmental Protection Agency, Philadephia, Pa. Region III.
A. Montague.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 60-64. 4 tab.

Descriptors: *Sludge disposal, *Social aspects, Economics, *Municipal wastes, *Reclamation, Sludge treatment, Waste water treatment, Attitudes, Symbiosis.

Socio-economic factors affecting the implementation of various urban sludge disposal and utilization alternatives are discussed, with particular emphasis on land spreading. Although resistance in rural areas by neighboring communities to accept land spreading as a means of sludge utilization has been minimal, the same climate of receptiveness and cooperation has not yet developed in many large metropolitan areas. One source of concern hindering the use of municipal sludge for land spreading purposes is the heavy metal content of sludges. However, once psychological attitudes toward the utilization of waste materials become more favorable, the implementation of prudent management practices in sludge utilization should control the degree of environmental stress. The development of an active public awareness program on the benefits and liabilities of proposed sludge processing systems is recommended along with a realistic program for controlling heavy metals in waste water collection systems. Comparative costs of various sludge disposal and utilization techniques are presented to illustrate the economic advantages of landspreading sludge in specific situations. (See also W77-00009) (Kreager-FIRL)
W77-00013

SLUDGE MANAGEMENT ALTERNATIVES FOR COASTAL CITIES,
Engineering-Science, Inc., Berkeley, Calif.
T. Bursztynsky, and J. Davis.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 65-72. 13 tab, 7 ref.

Descriptors: *Sludge disposal, *Municipal wastes, *Cost-benefit analysis, *Reclamation, *Social aspects, Economics, Waste disposal, Oceans, Feasibility studies, California.
Identifiers: Ocean disposal.

Findings from a study of seven alternative sludge disposal options for the Southern California coastal area are summarized. Ocean disposal appears to be the least cost option by a wide margin, and its total abandonment is considered a misallocation of resources unless the environmental impact is clearly demonstrated to be greater than that of more costly alternatives. Composting for sale appears to be the most desirable method of sludge management on an overall basis. Environmental risks are minimized and some benefits are realized. The system has good public acceptability, land use compatibility, ease of implementation, and financial feasibility. To a large extent this is the system being employed at Los Angeles and Orange Counties, indicating that natural selection processes of public pressure, economic considerations, and environmental awareness have been at work. Detailed breakdowns of environmental, feasibility, performance, and economic factors are presented for the various sludge management alternatives considered. (See also W77-00009) (Kreager-FIRL)
W77-00014

BY-PRODUCT SOLIDS MANAGEMENT ALTERNATIVES CONSIDERED FOR PHILADELPHIA,
Greeley and Hansen, Chicago, Ill.
E. F. Ballotti, and T. E. Wilson.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 73-79. 7 tab, 1 ref.

Descriptors: *Municipal wastes, *Solid wastes, *Waste water treatment, *Waste disposal, *Reclamation, Economics, Biological treatment, Byproducts, Fertilizers, Pennsylvania.
Identifiers: *Philadelphia(Penn).

Alternative methods of managing byproduct solids generated by waste water treatment plants in the Philadelphia area are discussed. Biological processes generally rank better than physical-chemical processes from a cost, energy, and nutrient utilization standpoint. A number of land disposal alternatives utilizing anaerobically digested solids appear to have potential as acceptable management programs; however, it does not appear that a land disposal alternative is feasible for the total amount of solids removed in Philadelphia. The sea dispersal alternative, also utilizing anaerobic digestion as the stabilization process, has proven to be simple, economical, and easily controlled. Preliminary feasibility studies on an anhydrous and liquid ammonia alternative appear promosing. This alternative utilizes anaerobic digestion and converts excess digestion gas to the form of fertilizer commonly used for crop fertilization in the United States. (See also W77-00009) (Kreager-FIRL)
W77-00015

SLUDGE DISPOSAL ALTERNATIVES FOR BOSTON,
Havens and Emerson Ltd., Cleveland, Ohio.
G. D. Simpson.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California p 80-85. 1 fig, 5 tab, 5 ref.

Descriptors: *Sludge disposal, *Municipal wastes, *Incineration, *Cost-benefit analysis, *Dewatering, Reclamation, Byproducts, Programs, Waste water treatment, Massachusetts, Waste disposal, Land use, Feasibility studies.

Findings from a study of sludge disposal alternatives for the city of Boston are presented. Among three final alternatives considered (land application, dewatering and incineration, and wet oxidation), dewatering and incineration is the least cost option, being lower in capital cost than the nearest alternative by about $7.6 million and lower in total annual cost by about $1.6 million/year. From environmental and other non-cost standpoints, incineration rates are equal to or better than the other two alternatives in seven of nine categories; whereas land application rates are equal to or better than the other alternatives in only three of

nine categories. Based on the above findings, a detailed project plan is for chemically conditioning, vacuum filtering, and incinerating sludge from Boston's waste water treatment plants. Incinerator ash will be utilized for landfill to provide additional space required for a future secondary treatment plant. Ash leachate will be collected and recycled to treatment. (See also W77-00009) (Kreager-FIRL)
W77-00016

ALTERNATIVES FOR DISPOSAL FOR THE METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1,
Metropolitan Denver Sewage Disposal District Number 1, Commerce City, Colo.
W. J. Martin, and J. D. Boyle.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California p 86-90.

Descriptors: *Sludge disposal, *Municipal wastes, *Reclamation, *Feasibilty studies, *Economics, Cities, Colorado, Recycling, Symbiosis, Fertilizers, Waste water treatment, Byproducts.
Identifiers: *Denver(Colo).

Findings from a study of alternative methods for disposing of or utilizing sludge generated by waste water treatment facilities in the Metropolitan Denver area are presented. Agricultural reuse is considered the most desirable sludge managemet system for the district based on environmental, engineering, and economic considerations. The system requires little power compared to other alternatives, and methane gas which is a byproduct of anaerobic digestion can be used to heat and mix the digesters. Outside fuel power will be required only to operate various pumps in the system and vehicles at the drying and distribution center. The reuse system is also attractive because of its relatively simple operation and inherent flexibility for final sludge use. Additionally, the fertilizer or soil conditioner produced from sludge is a valuable agricultural resource in view of current and projected fertilizer shortages. Research efforts being conducted by the Metropolitan Denver Sewage Disposal District on the environmental impact of sludge utilization are also outlined. (See also W77-00009) (Kreager-FIRL).
W77-00017

UPDATING THE 1974 PITTSBURGH CONFERENCE,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5D.
W77-00019

SUMMARY OF THE ASCE SEMINAR ON SLUDGE DISPOSAL,
MCA Engineering Corp., Baltimore, Md.
For primary bibliographic entry see Field 5D.
W77-00020

THE PAST, PRESENT, AND FUTURE PROSPECTS OF BURNING MUNICIPAL SEWAGE SLUDGE ALONG WITH MIXED MUNICIPAL REFUSE,
Weston (Roy F.) Inc., West Chester, Pa.
E. M. Smith, and A. R. Daly.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 115-123. 4 fig, 1 tab, 35 ref.

Descriptors: *Sludge disposal, *Incineration, *Municipal wastes, *Sewage sludge, Treatment facilities, Dewatering, Drying.
Identifiers: Co-incineration, Mixed municipal refuse.

The use of co-incineration for burning municipal sewage sludge along with mixed municipal refuse is discussed in terms of past experience and future prospects. Experience with burning sludge in conventional refractory-wall mixed municipal refuse incinerators indicates that the moisture present in the sewage sludge depresses furnace temperature, thus necessitating reductions in excess air to hold the furnace gas temperature within the desirable range of 1400-1800F. However, when thickened sludge feed is used, adequate furnace temperatures can not be maintained even with zero excess air. Thus, it is necessary to dewater the sludge to about 20% solids, followed by drying, before the sludge solids are fed to the incinerator. A co-incineration option for the future is the use of conventional sludge incinerators modified to handle shredded and cleansed mixed municipal refuse. Various experimental co-incineration installations presently in operation throughout the world are described. (See also W77-00009) (Kreager-FIRL)
W77-00021

MANAGEMENT OF MUNICIPAL WASTEWATER TREATMENT RESIDUALS,
National Science Foundation, Washington, D. C.
For primary bibliographic entry see Field 5D.
W77-00023

PYROLYSIS OF SEWAGE SLUDGE,
Environmental Protection Agency, Cincinnati, Ohio.
R. A. Olexsey.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 139-145. 4 fig, 6 tab, 13 ref.

Descriptors: *Sludge disposal, *Sewage sludge, *Organic compounds, *Distillation, Incineration, Waste disposal, Pilot plants, Feasibility studies, Moisture content.
Identifiers: *Pyrolysis, Refuse.

The feasibility of using pyrolysis for sewage sludge disposal is discussed along with some preliminary findings from pilot-scale tests conducted by the Environmental Protection Agency and the Bureau of Mines. Pyrolysis is the destructive distillation of organic materials under heat and/or pressure in the absence of oxygen. Tests involving the pyrolysis of sludge alone reveal that the process represents a substantial improvement over conventional incineration with respect to fuel consumption and air pollutant emissions. However, the high moisture content of sewage sludge favors the use of a combination of sludge and dry organic material to reduce the energy requirements associated with evaporating the moisture in the sludge. Tests with mixtures of sludge and shredded solid waste indicate that this approach is feasible, although both the environmental aspects and economics of the process require further investigation. (See also W77-0009) (Kreager-FIRL)
W77-00024

SLUDGE PYROLYSIS FOR ENERGY RECOVERY AND POLLUTION CONTROL,
Stanford Research Inst., Menlo Park, Calif.
F. M. Lewis.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 146-152. 6 fig, 1 tab, 9 ref.

Descriptors: *Sludge disposal, *Distillation, *Waste treatment, *Energy conversion, *Thermodynamics, Treatment facilities, Heavy metals, Incineration, Economics.
Identifiers: *Pyrolysis.

The use of pyrolysis for sludge decomposition is discussed. Pyrolysis is an irreversible chemical change brought about by the action of heat in an atmosphere devoid of oxygen and offers advantages over conventional incineration in terms of fuel economy, energy recovery (steam generation), and control of heavy metals. An analysis the thermodynamics of various pyrolysis syste reveals that a proprietary pyrolysis reactor tha indirectly heated by the afterburner flue produ requires the least amount of auxiliary fuel. maximum efficiency in pyrolysis systems, a h solids content in the sludge cake and a low exc air rate are desirable. Techniques are curren available for producing a sludge cake in excess 40% total solids. The steam generated by a pyr sis system treating sludge can be used for generation of electricity or for operation of ac tors and pumps at waste water treatment pla (See also W77-00009) (Kreager-FIRL)
W77-00025

A SLUDGE POLICY FOR THE 70'S,
Environmental Protection Agency, San Francis Calif. Region IX.
L. R. Freeman.
In: Proceedings of the 1975 National Confere on Municipal Sludge Management and Dispo August 18-20, 1975, Anaheim, California, p 1 155.

Descriptors: *Sludge disposal, *Municipal wast *Legal aspects, *Institutions, Programs, Wa disposal, Conservation, Recycling, Reclamatio

Municipal sludge disposal is discussed in terms the responsibilities of the Environmental Prot tion Agency for setting a policy consistent w recent environmental legislation. Since Fede law and Federal/state policies require that feasi alternatives to ocean disposal must be pursu the first step in formulating a sludge dispo technique should involve the reclamation recycling of it in light of current conservat needs. Emphasis is placed on implementing ex ing technology to deal with existing or impend sludge disposal problems. The importance of fective institutional arrangements and public p ticipation in the implementation of sludge dispo policies is discussed. (See also W77-000 (Kreager-FIRL)
W77-00026

ECOLOGICAL IMPACT OF THE DISPOSAL MUNICIPAL SLUDGE ONTO LAND,
McCormick (Jack) and Associates, Inc., Dev Pa.
J. Schmid, D. Pennington, and J. McCormick
In: Proceedings of the 1975 National Conferen on Municipal Sludge Management and Dispo August 18-20, 1975, Anaheim, California, p 1 168. 9 fig, 2 tab, 16 ref.

Descriptors: *Sludge disposal, *Municipal wast *Ecology, *Land use, Agriculture, Wa disposal, Legislation, Reclamation, Recycli Symbiosis.

An evaluation of the ecological impact of disp ing of municipal sludge on land is present against the background of current water polluti legislation. A review of major land uses a characteristics in the United States and the pot tial impact of land disposal on natural vegetati and wildlife indicates that sludge disposal on la can be environmentally acceptable. Sludge ap cation, as contrasted to land-filling, is m apropriate. The most attractive sites for slud disposal appear to be those that are presently u ized for crop and livestock production. The mu ple use of these lands should be considered a h tional priority so that waste water can be reused improve soil conditions and fertility. Appro mately 18% of the total land surface in the cont minous states is considered to be unsuitable land disposal. (See also W77-00009) (Kreag FIRL)
W77-00027

PLANT UPTAKE OF HEAVY METALS FRO SEWAGE SLUDGE APPLIED TO LAND,
Department of Agriculture, Beltsville, Md.

For primary bibliographic entry see Field 5D.
W77-00028

EFFECTS OF SEWAGE SLUDGE OR EFFLUENT APPLICATION TO SOIL ON THE MOVEMENT OF NITROGEN, PHOSPHORUS, SOLUBLE SALTS AND TRACE ELEMENTS TO GROUNDWATERS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W77-00029

ENGINEERING STUDY AND FIELD DEMONSTRATION TRIALS FOR SAND DUNE STABILIZATION,
Ward (George D.) and Associates, Portland, Oreg.
G. D. Ward.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 200-203. 1 tab.

Descriptors: *Dunes, *On-site tests, *Soil stabilization, *Organic wastes, *Wind erosion, Erosion control, Soil erosion, Oregon.

Organic wastes were used in soil stabilization studies in a severe wind erosion area in northeast Oregon. The first study involved soil building using fiberous wastes. Numerous solid wastes in various concentrations were incorporated into a sandblow, which was then planted with dryland grasses in late 1972 and evaluated in 1973. The second study applied on a larger scale the sand control procedures which were found effective during the first study. Physical stabilization and seeding procedures were undertaken during the fall of 1973 and early spring of 1974. The program is similar to programs in Israel, the Isle of Jersey in the English Channel, and the Lowry Bombing Range in Colorado. In Israel, shredded municipal waste is covered with a layer of sand, then reseeded with desert vegetation. On Jersey, composted and shredded municipal waste, blended with blowsand, is used for developing turf. In Colorado, Denver's total sewage sludge is used to build soil. A layer of the sludge, which is mechanically thickened, is deposited, plowed, disced, and then seeded. The result is healthy range grass which is productive and resistant to wind erosion. Organic wastes successfully used in Oregon include liquid sewage sludge, papermill sludge, shredded bark and woodwastes, and feedlot bedding. A nitrogen source such as sewage sludge or feedlot waste must be provided with papermill sludge. (See also W77-00009) (Snyder-FIRL)
W77-00032

POTENTIAL HEALTH IMPACTS OF SLUDGE DISPOSAL ON THE LAND,
Environmental Protection Agency, Research Triangle Park, N.C.
For primary bibliographic entry see Field 5C.
W77-00033

FDA'S OVERVIEW OF THE POTENTIAL HEALTH HAZARDS ASSOCIATED WITH THE LAND APPLICATION OF MUNICIPAL WASTEWATER SLUDGES,
Food and Drug Administration, Washington, D.C.
G. L. Braude, C. F. Jelinek, and P. Corneliussen.
In: Proceedings of the 1975 National Conference on Municipal Sludge Management and Disposal, August 18-20, 1975, Anaheim, California, p 214-217. 3 tab.

Descriptors: Pollutant identification, *Public health, *Hazards, *Land use, *Sludge, Municipal wastes, Waste water(Pollution), Federal government.
Identifiers: Food and Drug Administration.

While proper use of good sludge on crops would not normally be expected to present a problem, contamination when sludges are improperly processed or applied on the wrong crops is of concern to the Food and Drug Administration (FDA). Direct physical contact with crops is a possible contamination mechanism. Contaminants may be retained in tissues of animals exposed when grazing or eating forage. Complete definitions of safe practices are currently unavailable due to insufficient data on the transfer of many contaminants through the food chain and on the toxicological effects to be expected. Many metals, including cadmium, are found at higher levels in crops grown on sludged soil than in controls in the same area. Sewage sludge contains persistent organic contaminants. Studies have shown that edible parts of plants contain these organics at levels 5 to 20% of the levels in the soils. The most likely contamination of foods would be in animals coming in contact with sludge and following failures of the sewage plant operation. The microbiologists feel crops eaten raw should not be planted within 3 yr of the last sludge application. Related FDA activities include surveys for heavy metals and pesticides in agricultural products, development of analytical methodology for heavy metals and pesticides, investigations on the survival of pathogens on vegetables grown in sludge treated soil, and toxicological studies to determine the effects of heavy metals and interaction between elements. There is currently no indication that sludge use must be limited to crops not in the human food chain or that all sludges are suitable for land application. (See also W77-00009) (Snyder-FIRL)
W77-00034

PROCESSING, ECONOMICS AND SALE OF HEAT DRIED SLUDGE,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W77-00037

COMPOSTING RAW SLUDGE,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5D.
W77-00038

CHEMICAL CHANGES IN THE SOIL SOLUTION FROM A SPODOSOL IRRIGATED WITH SECONDARY-TREATED SEWAGE EFFLUENT,
Florida Agricultural Experiment Station, Gainesville. Soil Science Dept.
C. C. Hortenstine.
Journal of Environmental Quality, Vol. 5, No. 3, p 325-338, July-September, 1976. 6 fig, 1 tab, 10 ref.

Descriptors: *Irrigation effects, *Waste water disposal, *Soil analysis, *Chemical analysis, Nitrogen, Phosphorus, Potassium, Nitrates, Nitrification, On-site investigations.
Identifiers: Spodosols.

Chemical changes in spodosols from near Orlando, Florida were investigated after irrigation with secondary-treated sewage effluent. Irrigation at a rate of 5 cm/week was initiated in July 1972 in an attempt to determine the renovative capability of the Spodosols. Phosphorus content increased from 0.03 ppm at all soil depths in the fall/winter of 1971/1972 to 1.25 ppm at 60 cm, 1.00 ppm at 90 cm, and 0.85 ppm at 120 cm by the fall of 1974. During this same period, potassium increased from 0.05 ppm at all three depths to 14 ppm. Nitrate-nitrogen, however, was consistently below 1.0 ppm. The effluent contained an average of 2.2 ppm nitrate-nitrogen, 14 ppm Kjeldahl nitrogen, 2.8 ppm phosphorus, and 16 ppm potassium. Laboratory tests of the soil indicated satisfactory nitrification; however, adverse conditions in the field curtailed the nitrifying process. Proper water control by tile installations will likely provide conditions that are suitable for nitrification. (Kreager-FIRL)
W77-00040

BIOASSAY PROCEDURES FOR THE OCEAN DISPOSAL PERMIT PROGRAM,
Environmental Protection Agency, Gulf Breeze, Fla. Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-00041

WASTEWATER SLUDGE AS A FERTILIZER SUBSTITUTE,
Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
D. L. Forster, T. J. Logan, R. H. Miller, and R. K. White.
Public Works, Vol. 107, No. 8, p 79-80, August, 1976. 2 tab, 3 ref.

Descriptors: *Sewage sludge, *Fertilizers, *Sludge disposal, *Farms, Costs, Irrigation, Overland flow, Ohio, Surveys, Viruses, Heavy metals, Monitoring, Attitudes.
Identifiers: Land spreading.

Data from a survey of waste water sludge land spreading practices in 43 communities throughout the state of Ohio are presented. The survey showed that all but nine of the communities using sludge as fertilizer were employing some type of sludge analysis at least semi-annually. About a third of the communities were also checking water quality near disposal sites. The equipment used for applying the sludge to land consisted mostly of tank trucks with either gravity or pumped discharge. Only four of the communities employed irrigation-overland flow systems. Average sludge handling costs per dry ton ranged from $25.20 for a plant flow capacity of 20 million gallons/day to $69.70 for a flow of 2 million gallons/day. Negative attitudes among landowners were associated mostly with concern about the possible existence of heavy metals, the possible survival of pathogenic viruses and human parasites, and the effect of runoff on water quality. (Kreager-FIRL)
W77-00046

WASTES FIND FERTILE FIELD AS LOW-COST PLANT NUTRIENTS,
P. M. Kohn.
Chemical Engineering, Vol. 83, No. 16, p 43-45, August 2, 1976. 1 fig.

Descriptors: *Waste treatment, *Sludge treatment, *Fertilizers, *Recycling, *Symbiosis, Municipal wastes, Industrial wastes, Sludge treatment, Economics, Nitrogen, Phosphorus, Potassium, Chemical wastes.

Developments in the use of transformed liquid waste as fertilizer are reviewed along with problems hindering the increased recycling of such wastes. The city of Houston, Texas, is presently flash-drying its activated sludge to form a material called 'Hou-Actinite.' The product has a nitrogen-phosphorus-potassium analysis of 5-5-0 and is sold to Texas rice farmers, Florida citrus growers and others. Hou-Actinite sells at $25-31/ton. Although this price brings no profit, the conversion of sludge to Hou-Actinite is preferable to using landfill as a disposal means. Pacific Disposal Systems, Incorporated, a firm that handles hazardous chemical wastes, plans to go onstream in the near future with a system that will convert waste nitric acid to ammonium nitrate which will be marketed as a fertilizer. Major drawbacks to the widespread use of wastes as fertilizers include their low nitrogen-phosphorus-potassium nutrient value, their high bulk and water content, and their variable quality. Also, the low value of such fertilizers makes their storage expense relatively high. (Kreager-FIRL)
W77-00050

RECENT ADVANCES IN SLUDGE TREATMENT AND DISPOSAL,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.

W77-00064

ECOLOGICALLY BALANCED COMMUNITY WASTEWATER DISPOSAL SYSTEMS MANAGEMENT FOR DEVELOPING COUNTRIES,
Jadavpur Univ., Calcutta (India).
For primary bibliographic entry see Field 5D.
W77-00066

MATHEMATICAL MODEL FOR PREDICTING THE CONSOLIDATION OF DREDGED MATERIAL IN CONFINED DISPOSAL AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 5B.
W77-00167

DRAIN OIL DISPOSAL IN WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W77-00209

GROUND-WATER QUALITY IN THE DAVIE LANDFILL, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-00486

5F. Water Treatment and Quality Alteration

FLOW APPROACHING FILTER WASHWATER TROUGHS,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W77-00053

POLYMERS PLAY INCREASED ROLE IN WATER CLARIFICATION,
Calgon Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W77-00082

MANGANESE AND IRON REMOVAL FROM WATER BY ADSORPTION ON DIATOMACEOUS EARTH,
Rhode Island Univ., Kingston. Dept. of Mechanical Engineering and Applied Mechanics.
F. J. DeLuise.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 776, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, (1976). 13 p, 6 fig, 3 ref. OWRT A-053-RI(1). 14-34-0001-6041.

Descriptors: *Manganese, *Iron, *Adsorption, Filtration, *Diatomaceous earth, Oxidation, *Water treatment, Methodology.

The removal of manganese from water supplies has always been a difficult practical problem because of the high filtration resistance caused by oxidized manganese. A method to reduce this resistance is investigated. Manganese and iron in water are oxidized under controlled conditions to form polymeric hydroxo complexes which are then adsorbed on diatomaceous earth and subsequently removed with the diatomaceous earth by a filtration process. Results with various grades and concentrations of diatomaceous earth are shown.
W77-00155

COMPARATIVE STUDIES ON THE ACTION OF CHLORINE AND OZONE ON POLIOVIRUSES IN THE REPROCESSING OF DRINKING WATER IN ESSEN, (IN GERMAN),
Essen Univ. (Gesamthochschule) (West Germany). Abteilung fuer Medizinische Virologie und Immunologie.
O. Thraenhart, and E. Kuwert.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 160(4/5), p 305-341, 1975.

Descriptors: *Potable water, *Chlorine, *Ozone, *Water treatment, *Viruses, Analyses, *Disinfection, Chlorination, Water pollution effects.
Identifiers: Essen(Germany), Picornavirus, *Polioviruses, Ozonation, *West Germany.

Defined quantities of Cl and ozone were examined for their poliovirus-inactivating effect in water without redox potential double-distilled water), water with low defined redox potential (double-distilled water + KOH), previously chlorinated water with a residual Cl content of 0.03 mg Cl/l (tap water) and water with a high redox potential (well water from the drinking water plant). Cl and ozone are essentially equivalent disinfectants. The initial rate and the kinetics of virus disinfection are identical. The efficacy of both disinfectants is affected by the condition of the water (redox potential, pH, etc.). In Essen (West Germany) reservoir water, good virus disinfection can be had with 1.0-1.5 mg ozone/liter (dissolved); such a concentration guarantees very little residual ozone. Continuous checking of the redox potential and the amount of the ozone added is necessary. Ozonation of water, probably by the cleavage of humic acid, promotes bacterial recontamination of the drinking water in city taps. Pre-ozonation combined with subsequent chlorination would guarantee safety and aesthetic improvement of the drinking water. Such a combination would be feasible with highly reduced amounts of ozone and Cl.--Copyright 1976, Biological Abstracts, Inc.
W77-00419

5G. Water Quality Control

THE USE OF CONTINUOUS SIMULATION IN THE EVALUATION OF WATER QUALITY MANAGEMENT PLANS,
Hydrocomp, Inc., Palo Alto, Calif.
A. S. Donigian, Jr., and R. K. Linsley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 677, Price codes: A05 in paper copy, A01 in microfiche. Completion Report No. 7422, Aug 76. 85 p, 24 fig, 9 tab, 87 ref. OWRT C-6134(5215)(1).

Descriptors: *Water quality, *Planning, *Project evaluation, *Frequency analysis, Benefit cost analysis, Benefits, Damages, Probability, Mathematical models, Hydrologic models, Simulation analysis.
Identifiers: Continuous simulation, Cost-effectiveness, Economic evaluation, Water quality modeling.

Demonstrated is a methodology for the evaluation of water quality plans analogous to procedures used in flood control planning, where flood damage frequency curves provide the basis for determining flood control benefits. The proposed methodology utilizes continuous water quality simulation to develop long term water quality information from which water quality frequency curves can be obtained. This frequency information allows the evaluation of the physical performance and impacts of proposed water quality control plans with specific consideration of the variable nature of the water resource. Using treatment costs and other economic indicators of water quality, the water quality frequency information can be used to estimate the cost-effectiveness and economic efficiency of alternative plans. The methodology is demonstrated in a typical urban environment; real hydrologic and climatic characteristics are assigned to an assumed watershed configuration. Alternate waste treatment levels, in-stream aeration, flow augmentation, and non-point source control plans are simulated and analyzed for both physical and economic impacts. The advantages of continuous simulation and its use in water quality planning are explored.
W77-00001

APPLICATION OF A HYDROLOGIC MODEL TO THE PLANNING AND DESIGN OF STORM DRAINAGE SYSTEMS FOR URBAN AREAS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W77-00004

INSTITUTIONAL PROBLEMS OF THE SMALL TREATMENT PLANT,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W77-00010

A SLUDGE POLICY FOR THE 70'S,
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5E.
W77-00026

REMOVAL VS BENEFITS: IT CAN BE TOO COSTLY,
Kansas City Water and Pollution Control Depts., Mo.
For primary bibliographic entry see Field 5D.
W77-00044

BEFORE REMOVING NUTRIENTS...RE-ANALYZE LAKE TAHOE,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5C.
W77-00045

CAUSES AND ALTERNATIVE SOLUTIONS TO THE WATER QUALITY PROBLEMS OF BIG STONE LAKE, WESTERN MINNESOTA-NORTHEASTERN SOUTH DAKOTA,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5C.
W77-00047

CLOSED LOOP HIERARCHICAL CONTROL FOR RIVER POLLUTION,
Saint John's Coll., Cambridge (England).
M. G. Singh, and M. Hassan.
Automatica, Vol. 12, No. 3, p 261-264, May, 1976. 3 fig, 3 tab, 11 ref.

Descriptors: *Water pollution control, *Rivers, *Mathematical models, Biochemical oxygen demand, Dissolved oxygen, Water quality control, Surface waters, Simulation analysis.

A feedback solution is obtained for a two-polluter river pollution control problem using a hierarchial method. The hierarchial optimization algorithm uses continuous time No Delay, Pure Delay, and Distributed Delay models of the Cam River near Cambridge. All of the calculations are done off-line within a decentralized computational structure. The resulting constant gains provide optimal feedback control for any initial condition, and this control can be implemented on-line. The method is also demonstrated on a three-polluter Distributed Delay model. Various simulation studies on river pollution problems associated with biochemical oxygen demand and dissolved oxygen show the efficacy of the method for river pollution control. (Kreager-FIRL)
W77-00051

IDELINES FOR SEDIMENT CONTROL IN RIGATION RETURN FLOW,
icultural Research Service, Kimberly, Idaho.
ke River Conservation Research Center.
. Carter.
rnal of Environmental Quality, Vol. 5, No. 2, p -124, April-June 1976. 1 tab, 17 ref.

scriptors: *Return flow, *Erosion control, igation water, *Sediment control, *Irrigation ctices, Water quality, Agriculture, Runoff, w, Furrow irrigation, Erosion, Cultivation, Fil- ion.
ntifiers: Soil loss.

liments in irrigation return flows arise mostly m erosion in furrows during irrigation, and sedi- nt concentrations vary widely from near zero to eral thousand ppm. Reducing both erosion and off would decrease the sediment in return ws. Technology is available for reducing both sion during irrigation and soil loss from the d, and for removing sediments from return ws. This technology was discussed, and the fol- ing guidelines were suggested: (1) Eliminate or uce irrigation return flows when conditions mit using irrigation methods with little or no ru- f. (2) Control the irrigation furrow slope so that run is across the steepest slope or on the con- r. Decrease the slope near the end of the furrow reduce the flow velocity and increase sedimen- on. (3) Control the furrow stream size and ke proper stream adjustments. Adequate water asuring equipment and controls are essential proper stream size control. (4) Shorten the run gth. (5) Control the irrigation duration to reduce number of irrigations per season. Alternate row irrigation reduces the contact between soil d flowing water and subsequent erosion. (6) Cul- ate only when necessary, avoiding excessive l loosening which increases erosion and soil s. (7) Control tailwater by assuring that it flows wly enough that sediments settle before the ter leaves the field. Filtering through grass ips removes sediments. (8) Utilize sediment re- tion basins to remove sediment from return ws. (Lee-ISWS)
77-00090

NNSYLVANIA TRIES NEW WATER QUALI- MANAGEMENT PLAN,
nnsylvania Dept. of Environmental Resources, rrisburg.
J. Kampschroer.
ater and Sewage Works, January 1976. p 47-49. 6 .

escriptors: *Water resources planning, *Water ality, *Water management(Applied), *Public rticipation, *Pennsylvania, Planning, Economic asibility, Social aspects, Institutions, Com- ehensive planning.
entifiers: *Comprehensive Water Quality anagement Planning Program(COWAMP), Waste water management.

e planning process of Pennsylvania's Com- ehensive Water Quality Management Planning ogram (COWAMP) is reviewed. The program compasses all aspects of waste-water manage- ent and pollution control, including point and n-point sources of pollution, agricultural runoff, andoned mine drainage, sludge disposal and oundwater quality protection. COWAMP, a ree year program established in the Department Environmental Resources in 1974, seeks to entify physical, financial, institutional and regu- tory steps involved in formulating its water anagement plan which is due in 1977. OWAMP's goal is to formulate a feasible plan at will achieve and maintain surface and ground- ater quality in an economically responsible anner, and consistent with other environmental als. Data collection involved topography, geolo- and climate of the 9 study areas the state was vided into (along hydrological boundaries); sur- ce and groundwater hydrology; population figures and present land use; existing water quality standards and methods used in water quality management; and soil classification. From these data 2 projections were made: prediction of the future based on historical trends, and a projection considering special environmental concerns expressed by local study committees. A cooperative arrangement between regional planning agencies, consulting firms and the Department of Environmental Resources was established to encourage public participation. In this way communication was facilitated between local advisory committees and the state. (Gentry-North Carolina).
W77-00107

A RELIABILITY ASSESSMENT FOR REGIONAL WATER QUALITY MANAGEMENT,
Texas Univ., San Antonio. Div. of Environmental Studies.
C. S. Shih.
Computers and Operations Research, Vol 3, No 2/3, p 145-155, August 1976. 9 fig, 1 tab, 4 ref.

Descriptors: *Water quality control, *Reliability, *Simulation analysis, *Optimization, *River basins, Management, Regional analysis, Assessment, Stochastic processes, Decision making, Streams, Waste water treatment, Annual, Operation and maintenance, Costs, Amortization, Equations, Mathematical models, Systems analysis, *Texas.
Identifiers: *Cost minimization, *Stochastic quadratic programming, Transition functions, Chance constraints, Linear constraints, Multiple linear regression, Sensitivity analysis, *San Antonio River Basin(Tex).

Deterministic criteria have always been employed in establishing managerial goals for urban water quality management. However, the different parameters, such as quantity and quality of waste treatment discharges, irrigation return flows and urban runoff, that characterize regional water quality are probabilistic in nature. Thus, the attainment of managerial goals will inherently exhibit the characteristics of uncertainty. Herein, the concept of reliability of water quality of a stream system is introduced. Reliability is defined as the percentage of time that specific water quality managerial goals can be attained. A simulation-optimization model has been developed for decision-making in regional water quality management. Stochastic quadratic programming techniques have been used in optimizing the basin-wide quality control strategy subject to a probabilistic constraint which reflects the desired reliability of the stream system. The optimization scheme facilitates the determination of the best pollution control decisions for each treatment facility while minimizing the total regional annual cost, subject to the quality criteria, and the desired level of reliability. Practical application of the model to the San Antonio River Basin, Texas, has been analyzed and a sensitivity analysis conducted which is based on varying degrees of the system reliability. (Bell-Cornell)
W77-00114

ENVIRONMENTAL EFFECTS OF ALTERNATIVE ENERGY DEVELOPMENTS IN THE NORTHERN GREAT PLAINS,
United Nations, New York.
For primary bibliographic entry see Field 6G.
W77-00115

OR DATA BASE INTERFACE--AN APPLICATION TO POLLUTION CONTROL,
Carnegie-Mellon Univ., Pittsburgh, Pa.
W. D. Haseman, C. Holsapple, and A. B. Whinston.
Computers and Operations Research, Vol 3, No 2/3, p 229-240, August 1976. 8 fig, 15 ref.

Descriptors: *Planning, *Computers, *Water quality, *Management, *Water pollution control, Computer programs, Optimization, Simulation analysis, River basins, Costs, Economics, Mathematical models, Operations research.
Identifiers: *Data base management system, *Query language.

A generalizing planning system (GPLAN) is presented which allows for a collection of operations research models to be easily integrated with a data base management system. An example is discussed dealing with a water pollution problem, which is analyzed for its structural complexity and informational requirements; a high level query language is discussed which allows a planner to use such a system without particular computer expertise. The technique presented provides participants in the planning process with information about the costs and water quality effects of alternative treatment strategies. The method has two aspects: (1) simulation, involving the capacity to determine the water quality characteristics implied by a given treatment strategy; and (2) optimization, to minimize the basin-wide treatment costs, subject to satisfaction of water quality goals. GPLAN is capable of supporting data bases and models for a wide variety of planning problems. (Bell-Cornell)
W77-00116

OPTIMIZATION OF STATE WATER QUALITY MONITORING SYSTEMS,
Environmental Research Lab., Corvallis. Oreg.
D. H. Lewis.
Computers and Operations Research, Vol. 3, No. 2/3, p 127-143, August 1976. 3 fig, 6 tab, 7 ref.

Descriptors: *Water quality, *Monitoring, *Optimization, *Water pollution control, Methodology, Networks, Sampling, Federal Water Pollution Control Act, Probability, Resource allocation, Effluents, Standards, River basins, Design, Computers, Operations research.
Identifiers: Steepest descent technique, Maximum marginal return, Wabash River(Ind Ill), Environmental cost minimization.

The water quality monitoring activities required of the States under the Federal Water Pollution Control Act Ammendments (PL92-500) will require resources well beyond what is likely to be available, if current systems structures and operating procedures are followed. This paper describes some quantitative procedures developed to optimize monitoring resource allocation, with the goal of getting the greatest possible return on a limited monitoring budget. The ambient and effluent standards which form the basis of the monitoring system are described. Stochastic inputs to the river basin which lead to violations of these standards are identified, and progress in characterizing these variations mathematically is discussed. Quantitative priority-setting procedures for the two principal monitoring activities (ambient and effluent), which account for these stochastic inputs are reviewed. Both procedures are designed to tell the state agency planner where the next increment of resource should be expended to maximize alternative monitoring objective functions. Approaches to integrating these two primary monitoring functions and opportunities for further applications of operations research techniques to improve program effectiveness and efficiency are suggested. (Bell-Cornell)
W77-00120

THE USE OF STOCHASTIC MODELS IN THE INTERPRETATION OF HISTORICAL DATA FROM SEWAGE TREATMENT PLANTS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5D.
W77-00121

SOME THOUGHTS ON ZERO DISCHARGE,
Monroe County Drain Commission, Mich.
P. Fleming.

Engineering Issues, Journal of Professional Activities, Proceedings of the American Society of Civil Engineers, Vol. 102, No. E12, p 179-181, April 1976.

Descriptors: *Water pollution, *Sewage, *Effluents, *Natural resources, Archaeology, Ecology, Conservation, Legislation, Pollution abatement.
Identifiers: *Federal laws, *Professional activities, *Zero discharge.

The concept of zero discharge, as presented in the Federal Water Pollution Control Act Amendments of 1972, Public Law 92-500, is based on a philosophy that man is basically not compatible with nature. The long-term effects of such a philosphy are difficult to see, but at best, little good can come from disenfranchising man from nature. As an alternative, the goal of water pollution abatement should be to seek ways in which the waste products of man's activity can be returned to the environmental cycle in a way that represents the best long-term interests of man. (Bell-Cornell)
W77-00125

INVESTIGATION OF BACTERIOLOGICAL POLLUTION OF RECREATIONAL WATERS IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management; and Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5B.
W77-00153

SURFACE RUNOFF LOSSES OF FERTILIZER ELEMENTS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy; and Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5B.
W77-00165

NITROGEN IN SUBSURFACE DISCHARGE FROM AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 5B.
W77-00166

A REGIONAL MARKET FOR RIGHTS TO USER FERTILIZER AS A MEANS OF ACHIEVING WATER QUALITY STANDARDS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
C. R. Taylor.
Journal of Environmental Economics and Management, Vol. 2, No. 1, p. 7-17, 1975. 3 fig., 4 tab., 12 ref.

Descriptors: *Control, *Rates of application, *Fertilizers, *Permits, *Taxes, Nitrogen, Nitrates, Nitrites, Water pollution control, Crop production, Illinois, Regional economics, Water quality.
Identifiers: *Fertilizer rights, *Fertilizer excise tax.

The market for rights to use nitrogen fertilizer policy is compared with a fixed per unit excise tax on fertilizer and some effects of these nitrogenous fertilizer restrictions on crop production in Illinois are empirically examined. It is shown that the net effect of the two policies on production and distribution of income from production at a given point would be the same only if no rights were purchased by nonusers of fertilizer. However, there were three important differences: (1) Different options are available to nonusers to influence the amount of fertilizer used, (2) the effects of adapting the policies to annual changes in economic conditions and social values differ, and (3) the rights policy allows more precise control over the total amount of fertilizer used, which is particularly important if a water quality standard is to be managed by controlling the use of fertilizer. Results also indicate that the use of a tax or rights policy in Illinois would increase nitrogen fertilizer use in other states, thus illustrating the need for a national coordination of fertilizer use policies. (Luedtke-Wisconsin)
W77-00173

OFFSHORE INDUSTRIAL-PORT ISLANDS,
Delaware Univ., Newark. Coll. of Marine Studies.
R. B. Biggs.
Oceanus, Vol. 19, No. 1, p. 57-66, 1975.

Descriptors: *Offshore platforms, *Industrial plants, *Islands, *Design, Industrial wastes, Treatment facilities, Construction costs, Feasibility, Environmental effects, Legal aspects, Jurisdiction.
Identifiers: *Artificial sea-islands.

Because many major United States industrial centers dependent on water transportation are sited on estuaries too shallow to handle modern ships, too small to assimilate wastes, and valuable as a biological-recreational resource, the concept of a multipurpose offshore industrial-port island is discussed. Based on criteria for selection of island candidates (importance of industry to national economy and defence; history of plant site acquisition problems; source, volume, and form of raw materials needed; noxious, nuisance, or hazardous nature of the industry; and whether the industry is labor or capital intensive), possible candidate industries considered are petroleum refining, petrochemical manufacturing, electric power generation (fossil and nuclear), deepwater terminals, liquified natural gas regasification, urban solid-waste processing and disposal, fertilizer manufacturing, paper manufacturing, electrometals processing, iron reduction and steelmaking, and nuclear fuel reprocessing. A 500,000 barrel/day refinery core was selected as an example of a complex that could be constructed off the northeastern United States shore. The key input would be imported crude oil and/or oil produced in nearby offshore fields. Outputs would be refined petroleum products and petro-chemicals. Construction design and costs, environmental effects, labor transportation, and legal-jurisdictional issues are discussed. (Buchanan-Davidson—Wisconsin)
W77-00176

BEWARE THE WRATH OF OSIRIS,
For primary bibliographic entry see Field 4A.
W77-00177

CONCEPTUAL FRAMEWORK OF ENVIRONMENTAL MANAGEMENT,
Cleveland Dept. of Public Utilities, Ohio. Div. of Utilities Engineering.
For primary bibliographic entry see Field 6G.
W77-00178

THE ENVIRONMENT AND THE STRUCTURE OF SOCIAL GOALS,
J. Klackova.
Eastern European Economics, Vol. 14, No. 1, p. 88-113, 1975. 1 tab., 2 ref.

Descriptors: *Pollution taxes(Charges), *Systems analysis, Economics, Pollution abatement, Pricing, Environmental effects, Costs, Social aspects, Mathematical studies, Welfare(Economics), Economic rent.
Identifiers: *Environmental quality, *Czechoslovakia, Socialism.

The fundamental economic aspects of environmental conservation in a socialist society are analyzed from a theoretical point of view. The central issue is to learn to quantitatively measure the social utility of the natural environment, viewing it as an article of consumption. A simplified three-element vector is formulated relating production, consumption, and environmen quality in a static situation. The environmen quality component is incorporated at the outset the planning/decision making process and plac on the same level in the system of material inc tives as the production/consumption activiti Financial payments for unit damage to the e vironment must equal the total social harm s fered by the community. In this way the effect investment in reducing damage is evaluated at t level of enterprise decision making and the inst lation of pollution control equipment will figure cost reduction due to lower payments for pol tion. In practice, the use of the price system a fixed environmental standards will not necessar guarantee a socially optimum allocation of acti ties. However, it is an acceptable method since is demonstrated that a uniform payment rate f waste and injurious substances achieves t desired environmental goals at the lowest soc cost. (Luedtke-Wisconsin)
W77-00181

SUBSTITUTE CHEMICAL PROGRAM: INITIA SCIENTIFIC AND MINIECONOMIC REVIE OF MALATHION.
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5C.
W77-00192

THE BUDDING ENVIRONMENTAL CLEAN-U (A VIEWPOINT): PART I. POLLUTION AN ENVIRONMENT,
Bordeaux-1 Univ., Talence (France). Dept. Geography.
R. H. Charlier, and M. Vigneaux.
International Journal of Environmental Studi Vol. 8, No. 2, p. 121-136, 1975. 11 fig.

Descriptors: *Environment, *Pollution abatemen Foreign countries, Air pollution, Water pollutio Thermal pollution, Eutrophication, Surveys, I dustrial production, Attitudes, Social aspect Long-term planning, Projections.

This first of a two-part paper deals with worldwi environmental degradation and current a proposed solutions of the resultant problems. T reactions and interactions of environmental fa tors are examined and some blatant cases of poll tion damage are cited. The concept of enviro ment; the process of the universe; physical facto such as climates, air, water, and soil; social facto such as rural and urban habitats, means of tra portation, and free time; adaptations, accommod tion an modifications; together with the i moderate actions of man are considered. Specif instances of pollution problems in the Unit States, the area of the Caspian Sea, the Sovi Union, Belgium, Germany, and Italy are brief stated. Recognition of these problems and vario countermeasures being taken to correct them a also briefly mentioned. Possible solutions all poi in the direction of education: humans must reeducated in terms of values, needs, want unemployment, obsolescence rate, recycling used raw materials, and a philosophical redirecti of interests away from our consumer-orient society. (Luedtke-Wisconsin)
W77-00194

EVALUATION OF MULTI-PURPOS OFFSHORE INDUSTRIAL-PORT ISLAND VOL II: MAJOR RESEARCH PROBLEMS AN PROMISING RESEARCH APPROACHES,
Delaware Univ., Newark. Coll. of Marine Studies
For primary bibliographic entry see Field 8C.
W77-00199

DEVELOPING A TOTAL OIL SPILL CLEANU CAPABILITY IN THE SAN FRANCISCO BA AREA,
Clean Bay Inc., Concord, Calif.
F. M. Smith.

: Prevention and Control of Oil Spills, oceedings of Joint Conference, Washington, C, March 13-15, 1973. p 21-26, 7 fig, 5 ref.

escriptors: *California, *Bays, *Oil spills, *Oill llution, Water pollution, *Water quality control, ollution abatement, *Skimming, Coasts, Acdents, Treatment, Separation techniques.
entifiers: *Accident prevention, *Oil booms, llution cleanup, Spill cleanup, San Francisco ay, US West Coast, Clean up.

progress report is given on the development of a tal capability for rapid cleanup of oil spills in the reater San Francisco Bay Area and 340 miles of ean coastline outside the Bay by Clean Bay Inc., ten-member non-profit corporation formed on ly 1, 1971. CBI devised a three-phase Master an for completion by July 1, 1974; Evolved an oil ill contingency plan through testing and revion; Developed first aid capability available to ch member facility for small spill cleanup; stered closer working relationships with other est Coast oil spill cooperatives; and Impleented a concerted approach to working with vernmental agencies and environmental and wilife organizations. Major emphasis was placed on reparedness for massive spills, with a supporting le in minor incidents in conjunction with the first d capability of member companies. (See also 76-09312) (Sinha-OEIS)
77-00200

PILL PREVENTION--PHASE II,
nvironmental Protection Agency, Washington, .C. Div. of Oil and Hazardous Materials.
. D. Van Cleave.
n: Prevention and Control of Oil Spills, roceedings of Joint Conference, Washington, .C., March 13-15, 1973. p 27-29.

escriptors: *Oil spills, *Oil pollution, *Pollution batement, *Water quality control, Water pollution, *Regulation, Transportation, Conservation, afety factors, Navigation.
dentifiers: *Oil spill prevention, Accident prevention.

he EPA prevention program as it related to naonal oil spill problems is discussed. The national rogram revolves around the spill prevention, conol and countermeasure (SPCC) concept which inorporates contingency planning, spill response nd prevention into one single comprehensive proram. This approach permits flexibility in design nd encourages innovation so that each facility ay develop an optimum plan to eliminate spills. It recognized that a facility's age, location and unction must be evaluated to determine the best alance between prevention measures and effecve spill response. The first phase of this program as initiated through special provisions of the efuse Act Permit Program. The program will be xpanded with the promulgation of the oil prevenon regulation which is being developed in acordance with Section 11(j)(1)(C) of the Federal Vater Pollution Control Act as amended. (See also V76-09312) (Sinha-OEIS)
W77-00201

PILL PREVENTION IN OFFSHORE ETROLEUM PRODUCING FACILITIES,
Exxon Co., Houston, Tex.
). G. Warner.
n: Prevention and Control of Oil Spills, roceedings of Joint Conference, Washington,)C, March 13-15, 1973. p 31-37, 9 fig, 8 ref.

escriptors: *Offshore platforms, *Oil industry, Oil pollution, Resources development, *Water uality control, *Pollution abatement, *Safety facors, *Regulation, Operations, Equipment, Acidents, Training, Personnel.
dentifiers: Production facilities, *Petroleum roduction, *Offshore technology, Pollution con-ol systems.

Spill prevention equipment and procedures using in offshore oil production are reviewed and the programs to achieve maximum protection by Exxon Company, U.S.A. and Industry are discussed. Several pollution prevention systems are utilized. Subsurface safety valves shut in the wells below the mud line if an emergency develops. Surface safety valves on each well provide automatic shut-in if an abnormal condition is detected by one of a large number of platform sensors. Oil leaks are retained in sumps. Sand erosion detectors are installed on wells to identify potential erosional failures before they can occur. It is concluded that various Industry and regulatory programs are providing the pollution control that is needed. Technological developments and reliability improvements are continuing. Ongoing work emphasizes development of improved subsurface safety valve concepts applicable to all wells, better manufacturing quality control and standards, and future reductions of human errors through training and safety programs. (See also W76-09312)
W77-00202

OIL SPILL PREVENTION MEASURES FOR THE TRANS-ALASKA PIPELINE SYSTEM,
Alyeska Pipeline Service Co., Houston, Tex.
E. W. Wellbaum.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 39-43.

Descriptors: *Pipelines, *Oil spills, *Oil pollution, *Oil industry, Accidents, *Earthquakes, *Environmental effects, Resources development, *Alaska, Safety factors, Natural resources, Weather, Hazards, Transportation, Planning.
Identifiers: *Trans-Alaska pipeline system, *Production facilities, *Petroleum production, Tankers, Spill prevention.

Alyeska Pipeline Service Company is responsible for design, construction, operation, and maintenance of the pipeline system which will move crude oil produced on the Alaskan North Slope along a route to Valdez, an ice free port located on an arm of Prince William Sound. At Valdez, the oil will be transferred to ocean going tankers. The amount of technical preplanning and the extent of environmental studies undertaken in preparation for this project are unprecedented. Oil spill contingency planning recognizes that despite the best efforts in design, construction, operation and maintenance, Alyeska must be prepared to handle an oil spill at any point on the system during its operating life. The maximum oil spill from complete separation of the pipeline will be limited by the placement of 136 check and remotely operated mainline valves. The maximum drainage after valve closure is 50,000 barrels and this can occur in only 1.5% of the line. The maximum drainage for over half of the line length is 15,000 barrels. Drainage basin studies are now being completed which will identify the route of flow of oil spills from each foot of the pipeline. Stream flow rates for summer, break-up, and floods are being determined so that the speed of the oil flow can be estimated. This data, along with snow, ice, and meteorological information will be stored in a computer data bank for use in generating oil spill response actions. Similar data is being collected for action plans for an oil spill in Port Valdez. It is Alyeska's intention to have oil spill contingency plans--which have been tested--completed on year before start-up of the system. (See also W76-09312)
W77-00203

COAST GUARD TRANSFER MONITORING PROGRAM,
Coast Guard, Washington, D. C. Marine Environmental Protection Div.
For primary bibliographic entry see Field 5B.
W77-00204

DESIGN OF A REFINERY DOCK TO PREVENT OIL SPILLS,
Shell Oil Co., Wood River, Ill. Wood River Refinery.
L. D. Nieman, W. G. Cline, and C. R. Woodford.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 53-59, 8 fig.

Descriptors: *Oil spills, *Oil pollution, Water pollution, *Pollution abatement, *Water quality control, Mississippi River, Resources development, Docks, *Design.
Identifiers: Floating docks, Petroleum, Fuel transfer.

The modern dock operated by Shell Oil Company as part of the Wood River Refinery in Illinois was designed to include features which minimize the possibility of oil spills. The dock is located on the Mississippi River near St. Louis. It is comprised of four floating sections and is designed to load and unload barges only. Solid pipe loading arms are used to make the connections between the floating dock manifold and the barge header. The primary loading valves on the floats can be operated manually or electrically from a local station or remotely from the dock control center. Each floating dock is equipped with a drainage system to prevent spillage into the river. An intercom system provides communication between the dock control center and the loading areas. The dock operator is also in direct radio and telephone contact with refinery operating personnel responsible for the transfer of oil. Operation of this facility has met the criteria of efficient operation and protection against spills. (See also W76-09312) (Sinha-OEIS)
W77-00205

A DUAL PROGRAM FOR PREVENTION OF OIL SPILLS IN OFFSHORE DRILLING AND PRODUCING OPERATIONS,
Shell Oil Co., New Orleans, La.
R. L. Wilson, and O. J. Shirley.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 61-63.

Descriptors: *Oil spills, *Oil pollution, *Offshore platforms, *Water quality control, *Pollution abatement, Drilling, Accidents, Gulf of Mexico, Resources development, Safety, Operation and maintenance, Continental Shelf.
Identifiers: *Outer Continental Shelf, Waterways, Personnel training, Production activities, Equipment failure, Human error, Offshore technology.

Virtually all oil spills resulting from oil drilling and production activities in the Nation's waterways are caused by accidents. Therefore it follows that prevention of accidents and prevention of oil spills are synonymous objectives. Accidents can be broadly classified into two categories, that is those caused by equipment failure and those caused by human error. A program for accident prevention addressing both causes was developed and has now been fully implemented throughout Shell Oil Company's offshore operations in the Gulf of Mexico. (See also W76-09312) (Sinha-OEIS)
W77-00206

PREVENTION--THE BEST METHOD OF CONTROLLING POLLUTION,
Sun Oil Co., Dallas, Tex.
F. C. Folger, Jr.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 65-67.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Offshore platforms, *Water quality control, Accidents, Environmental engineering drilling, Operation and Maintenance, Testing.
Identifiers: Personnel training, Equipment design, Production operations.

The primary objective of an environmental management program must be to prevent pollution. The techniques and procedures which are practical, readily applied, and easily administered are discussed. They can be incorporated into day-to-day operations with no disruption, and a minimum of additional effort. Equipment design (with particular respect to whether or not original design is still suitable for current operating conditions), alarm and shut-down systems, inspection and testing, maintenance, and operation are considered. Also considered are personnel training, definition of duties and responsibilities, and interdependence of personnel to achieve a common objective. (See also W76-09312) (Sinha-OEIS)
W77-00207

PREVENTION IS BEST,
Union Oil Co. of California, Los Angeles.
G. H. Hemmen.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1975. p 69-71.

Descriptors: *Oil spills, *Oil pollution, *Operation and Maintenance, *Pollution abatement, *Water quality control, Environmental effects, Oil industry, Oily wastes, Equipment, Accidents, Cathodic protection.
Identifiers: Petroleum.

The history of the development of fiberglass reinforced plastic tanks, tank testing equipment, line leak detectors, pre-engineered cathodic protection systems and wrapping are reviewed. The extent of usage by marketers together with pros and cons are indicated. Various approaches directed towards the safe disposition of waste oils are reviewed along with a description of the joint industry efforts underway to find new and better ways of achieving ecologically sound means of handling this problem. In addition to the preventive type of action, a brief discussion of emergency procedures is given. (See also W76-09312) (Sinha-OEIS)
W77-00208

DRAIN OIL DISPOSAL IN WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
R. O. Ostrander, and S. J. Kleinert.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 73-78, 3 fig, 2 tab, 7 ref.

Descriptors: *Oil pollution, *Waste disposal, *Oil wastes, *Pollution abatement, Water pollution, *Environmental effects, *Wisconsin, Resources, Recycling.
Identifiers: *Drain oil disposal, Pollution prevention.

Service stations handle from 55 to 65% of the oil drained from crankcases in Wisconsin. Of this, 97.6% is re-used as lube oil, fuel oil, road oil or on farms. The remaining 2.4% is wasted but much of this is hauled to licensed disposal sites. For best use of a limited resource, drain oil should be re-refined as lube oil. Increased re-refining should be encouraged. A random sampling to determine the fate of oil drained by individuals is recommended so that we may have answers to this important segment of the overall problem. (See also W76-09312) (Sinha-OEIS)
W77-00209

OIL SPILL PREVENTION PRACTICES IN PIPELINES AND TERMINALS,
Sohio Pipe Line Corp., Cleveland, Ohio.
O. M. Turner.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, W[illegible]ngton, DC, March 13-15, 1973. p 79-84, 11 fig.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Pipelines, Storage tanks.
Identifiers: Personnel training, Terminal facilites, Terminals, Cargoe transfer, Containment.

Today, more than 200,000 miles of oil pipelines link a half-million oil wells with two hundred and fifty refineries and thousands of distribution terminals across the country. The petroleum industry goes to great lengths to assure the safety and reliability of its pipeline systems and terminal facilities. Both types of facilities require heavy capital investment, and both handle a commodity which is flammable. Routine petroleum transportation and storage practices have one major goal–product containment. Operating efficiency, safety, and pollution prevention are synonymous in pipeline transportation and storage, since the necessary goals in all three areas are achieved by containing the petroleum being transferred or stored. The industry lays no claim to perfection. But it has made remarkable progress in creating and employing preventive techniques and equipment–both in pipelines and in terminals. (See also W76-09312) (Sinha-OEIS)
W77-00210

TAGGING OIL-RESIDUES IN TANKERS WITH MICROPARTICLES,
Swedish Investigation Committee for Methods of Tagging Oil in Ships, Stockholm.
For primary bibliographic entry see Field 5A.
W77-00211

THE VISIBILITY OF OIL-WATER DISCHARGES,
National Environmental Research Center, Edison, N. J. Edison Water Quality Research Div.
For primary bibliographic entry see Field 5B.
W77-00212

THE DEVELOPMENT OF AN EXPERIMENTAL AIRBORNE LASER OIL SPILL REMOTE SENSING SYSTEM,
Transportation Systems Center, Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W77-00213

VOLUMETRIC DETERMINATION OF MARINE OIL SPILLS USING COORDINATED AIRBORNE AND SURFACE SAMPLING DATA,
California Univ. Santa Barbara.
For primary bibliographic entry see Field 5A.
W77-00214

DEVELOPMENT OF U.S. COAST GUARD PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM,
Coast Guard, Washington, D. C.; and Aerojet Electrosystems Co. Azusa, Calif.
For primary bibliographic entry see Field 5A.
W77-00215

REMOTE SAMPLER FOR DETERMINING RESIDUAL OIL CONTENT OF SURFACE WATERS,
Naval Ship Research and Development Center, Annapolis, MD.
For primary bibliographic entry see Field 5A.
W77-00216

AN OPTIMAL PREVENTION AND DETECTION MODEL FOR POLLUTION PATROL,
Purdue Univ., Lafayette, Ind. School of Industrial Engineering.
For primary bibliographic entry see Field 5A.
W77-00217

OIL SPILL-SOURCE CORRELATION BY GAS CHROMATOGRAPHY: AN EXPERIMENTAL EVALUATION OF SYSTEM PERFORMANCE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W77-00218

TECHNIQUES FOR ANALYSIS OF PARAFFI HYDROCARBONS AND FOR INTERPRETA TION OF DATA TO ASSESS OIL SPILL E FECTS IN AQUATIC ORGANISMS,
National Marine Fisheries Service, Seattle, Was Northwest Fisheries Center.
For primary bibliographic entry see Field 5A.
W77-00219

DETERMINATION OF N-ALKANE AN METHYLNAPHTHALENE COMPOUNDS I SHELLFISH,
Battelle-Pacific Northwest Labs., Richlan Wash.
For primary bibliographic entry see Field 5A.
W77-00220

IDENTIFICATION OF OIL POLLUTANTS: REVIEW OF SOME RECENT METHODS,
National Environmental Research Center, Ediso N. J. Edison Water Quality Research Div.
For primary bibliographic entry see Field 5A.
W77-00221

A MULTIPARAMETER OIL POLLUTIO SOURCE IDENTIFICATION SYSTEM,
Phillips Petroleum Co., Bartlesville, Okl Research Div.
For primary bibliographic entry see Field 5A.
W77-00222

CHARCTERISTICS OF NATURALLY OCCU RING AND POLLUTANT HYDROCARBONS I MARINE SEDIMENTS,
Paris Univ. (France).
For primary bibliographic entry see Field 5A.
W77-00223

COMPARATIVE IDENTIFICATION OF OI SPILLS BY FLUORESCENCE SPECTROSCOP FINGERPRINTING,
Environmental Protection Agency, Edison, N. Surveillance and Analysis Div.; and Environme tal Protection Agency, Edison, N. J. Region II.
For primary bibliographic entry see Field 5A.
W77-00224

LABORATORY AND FIELD TESTING OF SU FACE-FILM FORMING CHEMICALS FOR US AS OIL COLLECTING AGENTS,
Naval Research Lab., Washington, D. C.
For primary bibliographic entry see Field 5B.
W77-00226

DEVELOPMENT OF THE 'NEXT GENERA TION' CHEMICAL DISPERSANTS,
Exxon Research and Engineering Co., Florha Park, N. J.
G. P. Canevari.
In: Prevention and Control of Oil Spill Proceedings of Joint Conference, Washingto DC, March 13-15, 1973. p 231-240, 10 fig, 15 ref.

Descriptors: *Oil spills, *Oil pollution, Water po lution, *Water quality control, Quality contro *Dispersion, Chemical reactions.
Identifiers: *Outer Continental Shelf, Chemic dispersants, Biological effects, Drop size.

Despite the limitations of the mixing energ requirement, significant use of chemical dispe sants continues where their use, due to condition such as inability to recover oil, is appropriate an in adherence to regulatory agencies. Also contin ing are extensive laboratory studies to resolve th biological effects, particularly long term, o dispersed oil. Biological field surveys of seven

ecent major applications indicated that there was ttle or no evidence of detrimental effects but ore studies of this type are needed. The capabili- of chemical dispersion, as an approach to han- le oil spills under those conditions where oil ecovery is not possible, will be increased by or- ers of magnitude by the elimination of mixing nergy. This is the indicated approach for the 'next eneration' dispersants. Technical feasibility for ese no or low mixing chemicals is shown. The asic differences between these systems and con- ention systems were identified. Based on the haracteristics of the dispersant systems under evelopment, e.g., submicron droplets, the en- ironmental impact of these much finer droplets epresent the remaining major considerations. See also W76-09312) (Sinha-OEIS)
V77-00227

NGINEERING STUDY OF AN OIL GELLA- ION TECHNIQUE TO CONTROL SPILLS ROM DISTRESSED TANKERS,
Exxon Research and Engineering Co., Florham ark, N. J.
. M. Goldstein, R. M. Koros, and B. L. Tarmy.
n: Prevention and Control of Oil Spills, roceedings of Joint Conference, Washington, DC larch 13-15, 1973. p 247-253, 6 fig, 17 ref.

Descriptors: *Oil spills, *Oil pollution, Water pol- ution, *Water quality control, *Pollution abate- ent, *Gels, *Rheology.
dentifiers: *Outer Continental Shelf, Gellation, Crude oil, Tankers, Engineering design.

Crude oil gellation is a potentially attractive echnique for minimizing or preventing the loss of il from a distressed tanker by converting the iquid oil into a rigid solid. The procedure involves he chemical reaction of two organic liquid gelling gents dissolved in the oil to form a gelant com- ound which entraps the oil. The resulting gel vould float as a coherent mass if it were extruded rom a ship or escape as a result of tanker break- p. This paper presents the results of a program ndertaken to demonstrate in situ gellation on a arge scale, and to gather engineering design infor- nation for this technique. Engineering design data athered include the effect of mixing energy, mix- ng time, gellation time and temperature on gel trength. In addition, rheological properties of the el were examined to relate gel strength to the naximum fluid static head that may be maintained vithout flow through a certain hull hole. Details of gellation test with 500 bbl of South Louisiana rude oil are discussed. This work forms the basis or the further efforts on equipment development, election and evaluation required before this echnique can be used in the field. (See also W76- 9312) (Sinha-OEIS)
W77-00228

THE TOXICITY TESTING OF OILS AND DISPERSANTS: A EUROPEAN VIEW,
Ministry of Agriculture, Fisheries and Food, Lon- don (England).
K. W. Wilson, E. B. Cowell, and L. R. Beynon.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 255-261, 2 tab, 32 ref.

Descriptors: *Toxicity, *Oil spills, *Oil pollution, Water pollution, *Water quality control, *Pollution abatement, *Environmental effects, Dispersion, Ecosystems.
Identifiers: *Outer Continental Shelf, *Dispersants, *Ecological effects.

A review of European approaches to the purpose and problems of testing the toxicity of hydrocar- bons and dispersants is presented. The paper deals with the aims of toxicity tests, and draws distinc- tions between those devised for toxicity ranking purposes, required by governments and industry for assessing the potential of new products, and those tests done for predicting possible ecological effects from the spillage of oil or use of disper- sants. In discussing laboratory practice, chemical problems, standardisation, the selection of test or- ganisms, sampling, experimental design data processing and data presentation are considered. (See also W76-09312) (Sinha-OEIS)
W77-00229

BEHAVIORAL CHARACTERISTICS AND CLEANUP TECHNIQUES OF NORTH SLOPE CRUDE OIL IN AN ARCTIC WINTER EN- VIRONMENT,
Department of Transportation, Washington, D. C.; and Coast Guard, Washington, D. C.
T. J. McMinn, and P. Golden.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 263-276, 14 fig, 2 tab, 9 ref, 3 append.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Environmental effects, *Ice, Quality control, Gravity, Surfactants.
Identifiers: *Outer Continental Shelf, *Oil-ice interaction, North Slope, Arctic, Bering Sea, Dispersants, Sorbents.

This paper deals with the physical fate and behavior of crude oil when spilled on winter arctic ice and snow surfaces. The concepts and theories developed are a result of a series of experiments performed by Coast Guard personnel in the Alaskan arctic during January-February 1972. Spreading and aging of oil on ice and snow, the unique interaction phenomena of snow and crude oil, and effectiveness of various cleanup techniques attempted on crude spilled on snow and ice are considered. Oil spreading over ice and snow is largely unaffected by oil properties such as density, viscosity, and surface tension. Oil spreading rate is also believed not to be a function of ambient air temperatures. Terminal spreading limit, independent of oil properties, is a function of effective surface roughness and volume of oil spilled. Oil was found to age on arctic ice. The winter aging rate was found to be significant although reduced from summer aging rates. Migration of oil into the ice or snow surface is minimal. However, snow falling on the surface of a freshly spilled oil pool migrates into the oil forming a mixture that contains up to 80% snow (by volume). An array of sorbents, surfactants, and dispersants were tested with largely negative results. (See also W76-09312) (Sinha-OEIS)
W77-00230

DEVELOPMENT OF A POLYURETHANE FOAM MARINE OIL RECOVERY SYSTEM,
Shell Development Co., Houston, Tex. Pipeline Research and Development Lab.
J. P. Oxenham, R. A. Cochran, D. P. Hemphill, and J. P. Fraser.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 277-289, 20 fig, 6 tab, 4 ref.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Environmental effects, *Water quality control, Equipment.
Identifiers: *Outer Continental Shelf, Sorbents, Polyurethane foam, Oil booms, *Oil recovery.

A system has been developed for recovering spilled oil from water, under a wide variety of environmental conditions and for all types of oils, at rates up to 9,000 gal/hr. This system is based on the use of polyurethane foam, foamed on the job site, as a sorbent for the spilled oil. The foam is recirculated to increase efficiency and to lower unit costs. Equipment needed includes collection booms, an open-mesh chainlink belt for harvesting the oil-soaked sorbent, and a roller-wringer to remove oil and water from the foam. The foam is initially comminuted and distributed onto the water by means of a hay blower (mulcher), and recycled pneumatically or by mechanical conveyor. Recovered oil and water are transported to shore for further treatment prior to disposal. Used foal is disposed of by incineration. (See also W76-09312) (Sinha-OEIS)
W77-00231

DEVELOPMENT AND PRELIMINARY DESIGN OF A SORBENT OIL RECOVERY SYSTEM,
Hydronautics, Inc., Laurel, Md.
E. R. Miller, Jr.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 291-307, 18 fig, 7 tab, 1 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Water pollution, Water treatment, Equipment, Design criteria.
Identifiers: *Outer Continental Shelf, Oil recovery, Sorbents.

The development and preliminary design of a sorbent oil recovery system was carried out under contract to the EPA. The system is based on the use of open-cell reticulated polyurethane foam sorbent material. This material may be regenerated for use in a continuous system by mechanical squeezing. The development program included studies of the sorbent performance, the broadcasting system, the harvesting conveyor, the sorbent regenerator and the recovery platform performance. The results of the development program showed that an oil recovery system based on the continuous reuse of the sorbent material is feasible. Based on the data developed, a preliminary design for a 3000 GPH recovery system for protected waters was prepared. (See also W76-09312) (Sinha-OEIS)
W77-00232

SORBENT SYSTEM DEVELOPMENT FOR OIL SPILL CLEANUP,
National Environmental Research Center, Edison, N. J. Edison Water Quality Research Div.
J. S. Dorrler.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 309-314, 8 tab, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Water quality control.
Identifiers: *Outer Continental Shelf, *Wave action, *Wind effects, Sorbents.

Analysis of the research results indicate that mechanical sorbent systems can be used efficiently and effectively to recover spilled oil. Recovery efficiencies better than 90% can be expected. Within design limitations, wave action will have little effect on oil-sorbent recovery. In practice, wave action actually increases oil removal rates by bringing the oil into more intimate contact with the sorbent. Wind will produce detrimental effects on the broadcasting unit operation. These effects can be minimized by proper field operating techniques. (See also W76-09312) (Sinha-OEIS)
W77-00233

NEW DEVICE FOR REMOVING OIL SLICKS FROM THE SURFACE OF WATER,
Battelle Inst., Geneva (Switzerland).
J. J. Asper, and P. Bolli.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 315-332, 29 fig, 2 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Equipment, Pollution abatement, *Patents, Separation techniques.
Identifiers: *Outer Continental Shelf, *Variable pitch screw, Oil slicks, *Oil recovery.

In an analytical study of devices designed to remove oil slicks floating on water, the conclusion

was that the majority of existing devices are not easily adaptable to marine operation. To overcome this disadvantage, Battelle has conceived a new device. The system is composed of a rotating, multi-thread screw in a casing. The oil and water enter the system at a given speed and are trapped between the threads. As the pitch of the threads progressively diminishes, the oil thickens and is removed by a pump from a chamber situated at the end of the screw, while the water is removed through an aperture below the screw casing. Disordered motion of the waves is absorbed by the last stage of the screw and the whole device follows the movement of the swell. This paper also describes the related laboratory development work and data on the performance of the device. The Patent Service of Battelle-Geneva has filed U.S. patent application No. 258.242 dated 31/5/72, relative to the invention which is the subject of this paper in the name of SEACLEAN S.A. Patents have also been applied for in most maritime countries, in most countries having lakes and large waterways, and in other industrialized countries. (See also W76-09312) (Sinha-OEIS)
W77-00234

FREE VORTEX RECOVERY OF FLOATING OIL,
Scientific Associates, Inc., Santa Monica, Calif.
E. B. Nebeker, S. E. Rodriguez, and P. G. Mikolaj.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 333-338, 5 fig, 1 tab, 9 ref. DOT-CG-22878-A.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Water quality control, *Water pollution, *Skimming, Prototype tests, Equipment.
Identifiers: *Outer Continental Shelf, Crude oil, Fuel oil, Free Vortex, Sorbents, Vortex skimmer, *Oil recovery.

A technique using a free vortex to recover oil from high sea, stream, and harbor waters is presented. An oil slick will be drawn into the center of the vortex due to water flow induced by an impeller and other rotating hardware. As a result, a significant 'captive radius' is demonstrated which draws in oil from appreciable distances from the device - useful around piers, ships, etc., in harbors. Upon approaching the vortex, the oil will submerge and accumulate within a center region of the vortex. This pocket will contain a concentrated mass of oil which can be removed by conventional pumping. Since oil collection is not directly performed by hardware, but rather by the induced vortex flow, essentially the same hardware was also used to collect sorbent materials of various sizes and shapes. Tests were performed with a free vortex oil recovery device having an impeller diameter of two feet. Performance data were obtained both under quiescent water conditions and also under environmental conditions that simulated a severe sea state four with 20 knot winds and two knot currents. Oil recovery rates and oil/water ratios are reported for oil film thickness ranging between 1/16 to one inch thick using No. 2 Fuel Oil, Heavy Crude Oil, and a Residual Fuel Oil. (See also W76-09312) (Sinha-OEIS)
W77-00235

HIGH SEAS OIL RECOVERY SYSTEM,
Ocean Systems, Inc., Reston, Va.
F. A. March, and R. L. Beach.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 339-350, 10 fig, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Water quality control, Water pollution, *Prototype tests, Equipment weirs, Testing.
Identifiers: *Outer Continental Shelf, Pollution prevention, Scale models, Model tests, Oil booms, *Oil recovery.

A system for recovery of petroleum products from accidental offshore spills was developed and tested. The testing included both model testing and full scale testing of a 60 foot long system capable of recovering oil at a rate of 2,000 gal/min. The oil recovery rate is relatively independent of wind and wave conditions, surface temperature, oil specific gravity, oil-water interfacial tension and significant oil type variation. It is not affected by viscosity except for discharge hose pressure limitations above 10,000 SSU. The oil recovery system is air and truck transportable for rapid deployment to a remote spill location. It is completely self-contained having its own power unit, control system, and pumps. In its preferred deployment configuration it is used with oil containment booms for funneling the oil to the recovery system. A double weir system is employed to obtain the high performance of the system. The system is operated in such a way that oil thickens in front of the primary weir and then further thickens in front of the secondary weir, where it is withdrawn. Typically, the system concentrates free slicks from a thickness of 0.1 inches or less to a depth of approximately two feet in front of the secondary weir. The testing reported upon includes both model testing and full scale testing of the system. (See also W76-09312) (Sinha-OEIS)
W77-00236

OIL RECOVERY ON THE HIGH SEAS,
Coast Guard Research and Development Center, Groton, Conn.
J. T. Leigh.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 351-360, 3 fig, 9 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Water pollution, *Pollution abatement, *Prototype tests, *Environmental effects, Viscosity, Equipment.
Identifiers: *Outer Continental Shelf, Oil booms, *Oil recovery, Disc drum recovery system, Wave conforming weirbasin.

Two prototype oil recovery systems currently under construction are described. Design goals for the systems include air transportability, recovery of a complete range of oil types at 2000 gpm in a sea state 4, use with a Coast Guard developed boom and Coast Guard boats and ships. One system utilizes a rotating disc-drum for oil removal. The drum is mounted in a unique catamaran which utilizes inflatable pontoon hull sections. Oil recovery rate is dependent on viscosity, slick thickness, current and wave conditions. In all conditions efficiency is expected to approach 100 percent. The second system utilizes a wave conforming weirbasin. Oil recovery rate is primarily dependent on slick thickness and current. Efficiency is expected to approach 100 percent for all conditions. (See also W76-09312) (Sinha-OEIS)
W77-00237

OIL SPILL CONTAINMENT SYSTEM DEVELOPMENT AND TESTING PROGRAM,
Coast Guard, Washington, D.C.
R. N. Abrahams, and E. R. Miller, Jr.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 361-374, 15 fig.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Water quality control, *Water pollution, *Prototype tests, Barriers, Tests, Equipment.
Identifiers: *Outer Continental Shelf, *Oil slicks, *Containment barriers.

A prototype high seas oil containment barrier and interim air delivery system was constructed. Full size high seas field testing both with and without oil was conducted. A brief review of the containment barrier design features and development program is presented. A major part of the development program involved field testing. Th procedures and instrumentation used for the fiel tests are described. The results from the oil co tainment tests in calm water and waves ar presented in detail with qualitative and quantit tive data on oil loss mechanisms and rates. (Se also W76-05312) (Sinha-OEIS)
W77-00238

PHYSICAL REQUIREMENTS FOR OIL POLLU TION CONTROL BARRIERS,
Massachusetts Inst. of Tech. Cambridge. Dept. Ocean Engineering.
J. H. Milgram.
In: Prevention and Control of Oil Spill Proceedings of Joint Conference, Washingto DC, March 13-15, 1973. p 375-381, 6 fig, 4 ref.

Descriptors: *Oil spills, *Oil pollution, *Wat quality control, Water pollution, *Barrier *Pollution abatement, Equipment, Model studie Prototype tests.
Identifiers: *Outer Continental Shelf, Wave a tion, Wind effects.

An oil pollution control barrier must hav adequate strength to withstand wave and curre forces in the sea. In addition to this, it must b adequately strong to withstand nonoperating loa such as those encountered in constructio packaging, launching, recovery and refurbishme for further use. The barrier must have seakeepi responses which are correct for the purpose containing oil. Sway response of a barrier needed to avoid large relative flow velocities waves. Heavy response is needed so that the rel tive height of the oil on the barrier will not beco too large allowing oil to pass over the barrier become too low and allow oil to pass beneath th barrier. The roll angle of the barrier must be rel tively small to prevent leakage as well. The abo factors are considered in this paper. This co sideration is based on full scale trials of barrier theoretical studies and model tests. (See also W7 09312) (Sinha-OEIS)
W77-00239

MECHANICAL CONTROL OF OIL SPILL UTILIZING A STREAMLINED BOOM,
Ultrasystems, Inc., Newport Beach, Calif.
D. C. Wooten.
In: Prevention and Control of Oil Spill Proceedings of Joint Conference, Washingto DC, March 13-15, 1973. p 383-389, 6 fig, 1 tab, ref. EPA-68-01-0182.

Descriptors: *Oil spills, *Oil pollution, *Wat quality control, *Pollution abatement, *Model st dies, *Prototype tests, Equipment.
Identifiers: *Outer Continental Shelf, Bow wave *Oil booms, Wave action, Current action.

Conventional oil retention booms fail to contain in currents above one to two knots. A streamlin boom to operate in currents or while being tow in excess of two knots was designed and test under varying current and combined wave-curre conditions. The boom consists of airfoil-shap sections which resemble hydrofoils operating the water surface. The boom is designed so th the stagnation streamline at the leading edge of t foil is located beneath the oil spill under a range dynamic current and wave conditions. Motion the boom through the water (or the flow past t boom due to a net current) causes a bow wa which sweeps oil and water over the top of t leading edge of the boom and into a sump. Tes indicated that the streamlined boom profile has drag coefficient of less than one-third that of co ventional boom shapes. Collection efficiency me surements with oil indicate that collection efficie cies greater than 75% can be achieved at thr knots. (See also W76-09312) (Sinha-OEIS)
W77-00240

NALYTICAL EXAMINATION OF IL/WATER SEPARATION BY OALESCENCE,
avid W. Taylor Naval Ship Research and evelopment Center, Annapolis, Md.
M. Finger, and T. S. Yu.
: Prevention and Control of Oil Spills, roceedings of Joint Conference, Washington, C, March 13-15, 1973. p. 403-408, 10 fig, 2 ref.

escriptors: *Oil spills, *Oil pollution, *Pollution atement, *Water quality control, Water pollu-on, *Oily water, *Coalescence, *Separation chniques.
lentifiers: *Outer Continental Shelf, Bilge, Bal-st water.

he physical separation process of coalescence as been studied analytically under controlled con-tions in regard to the separation of oil from oily ater mixtures. Variations in coalescer per-rmance were studied as a function of the oily ater feed to a three stage prototype separation ystem of which coalescence was the final stage. he data were analyzed statistically and it was nown that increasing suspended solids concentra-on, increasing oil viscosity, and increasing oil oncentration decreased coalescer element fetime, however, above a certain level increasing l concentration had no effect. Variations in the tal flow rate in the range of one to four gallons er minute per square foot did not have a signifi-ant effect on coalescer element life. Under all onditions studied, the effluent water contained ss than 15 parts per million oil, only ten percent f the samples analyzed contained more than this mount. The results indicate that coalescence is seful as a final polishing step in an oil/water eparation system. (See also W76-09312) (Sinha-EIS)
W77-00241

VALUATION OF A UNIQUE CENTRIFUGE OR SEPARATION OF OIL FROM SHIP ISCHARGE WATER,
oster-Miller Associates, Inc., Waltham, Mass.
. C. Harvey, and V. K. Stokes.
: Prevention and Control of Oil Spills, roceedings of Joint Conference, Washington, C, March 13-15, 1973. p 391-402, 11 fig, 1 tab, 6 ef.

escriptors: *Oil spills, *Oil pollution, *Water uality control, Water pollution, *Pollution abate-ent, Discharge water, Equipment, Tests, Model tudies, Prototype tests, *Separation techniques.
lentifiers: *Outer Continental Shelf, Centrifuge, rude oils, Bilge, Ballast water, Drop size.

A centrifuge was conceived and tested especially or the separation of oil as it is usually dispersed in he bilge and ballast water of ships. The centrifuge s unusual in having predominantly axial flow al-owing comparatively high throughput and low peed. It has both primary and secondary stages of eparation incorporated into the design and is thus apable of operating with high input concentra-ons. The device was tested in the laboratory sing mixers in a storage tank and a centrifugal ump to disperse up to 8% oil in water. Effluent oncentrations in the range of 10 ppm were ob-ained with inputs containing 1000 ppm of No. 2, o. 4 and Nigerian Crude Oils. At higher concen-rations ranging up to 58,800 ppm for No. 2 oil and 8,900 for No. 4 oil the effluent contained less than 00 ppm. Centrifuge performance on No. 2 and o. 4 oils containing ten% Gamlen D was lower han with pure oils. Coalescence occurred but roduced drops smaller than with pure oils requir-g a modification to the separator design. The put and output oil droplet size distributions were easured using the Coulter particle counter. This ermitted an evaluation of separator performance s a function of the drop size content of the oil ispersion and a rational assessment of the design ethod and its application to the development of ture prototypes. (See also W76-09312) (Sinha-EIS)
W77-00242

IN-SITU MEASUREMENTS OF OIL BARRIER SHAPE AND LOADS DUE TO CURRENT ACTION,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
G. A. Brown, S. Bartlett, and W. Lamb.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 409-419, 8 fig, 4 tab, 12 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Pollution abatement, *Barriers, Equipment, Environmental effects.
Identifiers: *Outer Continental Shelf, Moored barriers, *Oil barriers, Current action, Wave action, In-situ measurements, Wind effects.

In-situ measurements were made of oil barrier shape and loads created by current action. A commercial cylinder and skirt type barrier with a 100 foot length was used. The barrier was located in Narragansett Bay near the Jamestown Bridge so that the bridge could be used for certain measurements in this experimental program. The barrier shape was obtained by taking transit readings from the Jamestown Bridge on painted target areas located at various spots along the barrier's cylindrical floatation members. The barrier was instrumented with two recording load cells-one at each end of the barrier–and two accelerometers located near the mid-point of the barrier for obtaining vertical and horizontal accelerations. Direct current measurements were made in the vicinity of the barrier by the drifting drogue technique. Wave data were taken with a capacitance wave staff. Local wind speed and direction were noted aboard the accompanying research vessel. The shape, load and current data were used to calculate effective and base coefficients for the barrier. The observed shape was used with several drag coefficient calculations to calculate a predicted drag force on the barrier. The calculated results from these studies are in reasonable agreement with model barrier data taken in laboratory facilities. (See also W76-09312) (Sinha-OEIS)
W77-00243

THE ISOLATION AND CHARACTERIZATION OF HYDROCARBON-UTILIZING BACTERIA FROM CHEDABUCTO BAY, NOVA SCOTIA,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
For primary bibliographic entry see Field 5A.
W77-00244

DESIGN PARAMETER STUDY OF AN OIL-SPILL BOOM,
Exxon Production Research Co., Houston, Tex.
J. S. Chung, G. R. Cunningham, and J. M. Evon.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 427-439, 17 fig, 2 tab, 6 ref, append.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Pollution abatement, Water pollution, Equipment, *Design.
Identifiers: *Outer Continental Shelf, *Oil booms, Catamaran booms, Containment.

Oil-spill containment boom design involves a broad area of technology: air-oil-water flow in the presence of a moving barrier, wave mechanics, and motions of bodies acted on by winds, waves, and currents. Although many devices have been designed to control oil spills, systematic parametric studies and published engineering design data have been scarce. For this reason, we have studied fundamental design parameters and tested their application to boom design with models in towing tanks and a full-scale sea trial in the Santa Barbara Channel. This work has developed the proper relationships between the size and shape of boom modules and waves to (1) achieve in-phase motions, (2) determine the optimum net depth for a net-system boom, (3) reduce modular interaction and damage, (4) reduce boom tensions, and (5) determine boom strength requirements. All these are interrelated, but the various parameters are presented by categories. The tests results supporting these parameters are also presented. (See also W76-09312) (Sinha-OEIS)
W77-00245

OIL WATER SEPARATION BY ULTRAFILTRATION,
Abcor, Inc., Cambridge, Mass.
R. L. Goldsmith, and S. Hossain.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 441-456, 20 fig, 5 tab, 4 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Water pollution, *Pollution abatement, *Oily water, *Oil wastes, Separation techniques, Membranes, Equipment, Membrane processes.
Identifiers: *Outer Continental Shelf, *Ultrafiltration, Ballast water, Bilge, Membrane ultrafiltration, Fuel oils, Crude oil, Ship discharges.

Ultrafiltration with one-inch diameter tubular membranes produced highly-purified water from oil emulsions. For kerosene, No. 6 Fuel oil, Venezuelan crude and lubricating oil at input ratios of 100 ppm to 90 percent, treated water was uniformly free of visible oil and had less than ten ppm oil. Ultrafiltration rate depended on oil type, input ratio and operating conditions. Typically, rates were high, but decreased with time due to membrane fouling. Factors which increased emulsion stability of decreased concentration polarization (e.g. high feed circulation rate) minimized fouling. Membrane cleanup was simple and effective, with no loss in long-term membrane capacity in over 3000 continuous test hours, with cleanup each 72 hours. Cost and physical requirements for systems of 10, 100, 1000, and 10,000 gpm were estimated for membranes in tubular and spiral would configurations. The latter, currently untested, is favored because of lower cost, weight, power, and space requirements. Field trials with actual oily wastes are recommended. (See also W76-09312) (Sinha-OEIS)
W77-00246

DROP SIZE DISTRIBUTIONS IN OIL WATER MIXTURES,
Foster-Miller Associates, Inc., Waltham, Mass.
V. K. Stokes, and A. C. Harvey.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 457-465, 9 fig, 2 tab, 9 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Water pollution, *Oily water, *Separation techniques, Emulsions, Instrumentation, Tests.
Identifiers: *Outer Continental Shelf, Centrifuges, Drop size, Settling.

The oil drop size distribution in oil water mixtures is of importance in the design of separators that make use of settling or enhanced settling as in centrifuges. This paper describes an attempt to identify the parameters that affect the size distribution of drops in mechanically generated emulsions. Oil/water mixtures were made by three different methods. On the basis of the results of these tests, a standard procedure for making mixtures was adopted. The results of an extensive series of tests, with three different oils, in which the drop size distributions were measured by a Coulter Counter are presented. (See also W76-09312) (Sinha-OEIS)
W77-00247

LARGE-SCALE EXPERIMENTS ON THE SPREADING OF OIL AT SEA AND ITS DISAPPEARANCE BY NATURAL FACTORS,
Department of Trade and Industry, Stevenage, (England). Warren Spring Lab.
P. G. Jeffery.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 469-474, 6 fig, 1 tab, 5 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water quality control, Water pollution, Dispersion.
Identifiers: *Outer Continental Shelf, *Oil slicks, Sea state, Oil spreading, Crude oil.

Those considerations that are of importance in undertaking large-scale oil-spreading experiments are described. One such experiment involving a discharge of 120 tons of Iranian Light Crude Oil in the North Atlantic is described, and the spreading pattern observed is reported in detail. The observations continued over a period of four days, after which the bulk of the oil had disappeared by natural factors, leaving only a few patches of thicker oil, largely in the form of a water-in-oil emulsion, which was also rapidly disappearing. Blokker constants have been calculated for the observed spreading of the slick, and these are reasonably constant throughout the four-day period. (See also W76-09312) (Sinha-OEIS)
W77-00248

MEASUREMENT OF EVAPORATION RATES FROM OIL SLICKS ON THE OPEN SEA,
California Univ., Santa Barbara. Dept. of Chemical and Nuclear Engineering.
H. O. Sivadier, and P. G. Mikolaj.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 475-484, 9 fig, 3 tab, 14 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water quality control, Water pollution, *Pollution abatement, Gas chromatography, Evaporation, Seepage, Pollutant identification, Evaporation.
Identifiers: *Outer Continental Shelf, Petroleum, Evaporation rate, Oil slicks, Sea surface roughness, Sea state.

A gas chromatographic method of analysis, applicable for all types of petroleum products, has been developed to measure the time dependent extent of evaporation from an oil slick on the open sea. Laboratory calibration tests show the method to have an uncertainty in evaporative weight loss of less than 1 percent. The method has been tested in the Santa Barbara Channel using oil from natural seeps at Coat Oil Point. Under sea state four conditions, this oil lost most of its volatile components in one to two hours. The resulting oil slick residue became sufficiently dense that it could easily enter the water column where it would be subjected to subsurface transport mechanisms. Sea surface roughness was observed to have a significant effect on the rate of evaporation. (See also W76-09312) (Sinha-OEIS)
W77-00249

FACTORS GOVERNING THE FATE OF OIL AT SEA; VARIATIONS IN THE AMOUNTS AND TYPES OF DISSOLVED OR DISPERSED MATERIALS DURING THE WEATHERING PROCESS,
Exxon Research and Engineering Co., Linden, N.J.
For primary bibliographic entry see Field 5B.
W77-00250

EXPERIMENTAL ECOSYSTEMS TO MEASURE FATE OF OIL SPILLS DISPERSED BY SURFACE ACTIVE PRODUCTS,
Institut Francais du Petrole, Rueil-Malmaison (France).
For primary bibliographic entry see Field 5B.
W77-00251

DISTRIBUTION OF HEAVY HYDROCARBONS IN SOME ATLANTIC OCEAN WATERS,
Exxon Research and Engineering Co., Linden, N.J.
For primary bibliographic entry see Field 5B.
W77-00252

PREDICTION OF OIL SLICK MOTIONS IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Dept. of Mechanical Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5B.
W77-00253

CLEANUP OF INLAND OIL SPILLS,
Esso Research Centre, Abingdon (England).
W. E. Betts.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 549-558, 16 fig, 4 ref, 3 append.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Water pollution, *Pollution abatement, Groundwater, Inland waterways, Equipment, Rivers, Lakes, Inland waterways.
Identifiers: *Cleanup methods, Fuel oil.

The requirements for dealing with accidental inland oil spills is outlined and the importance of using the optimum method of cleanup for each spill and the desirable features for cleanup equipment of efficiency, portability, low cost, ease of use, and versatility is emphasized. New devices are described and have been incorporated into a low-cost package of cleanup equipment. Examples of how a variety of spills have been successfully cleaned up include oil on a fast flowing stream, removal of accumulated oil in a port, oil on a covered drinking water reservoir and oil on rivers. Examples are also given of the method of handling underground pollution by hydraulic drive systems and by recovery from the groundwater for both shallow groundwaters up to 8m below the surface and deep drinking water bore holes. (See also W76-09312) (Sinha-OEIS)
W77-00254

TWO TYPES OF OIL SPILLS IN SWEDISH INLAND WATERS--TESTS OF NEW MATERIALS, IDEAS AND METHODS,
Swedish State Railways, Stockholm.
A. Jerbo.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 559-567, 12 fig, 5 tab.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Water pollution, *Pollution abatement, Equipment, Inland waterways, Sediments, Rivers.
Identifiers: Oil booms, *Sweden.

In February 1972, 600 tons of diesel oil was spilled in a river in the northern part of Sweden. Downstream from the spill is a system of hydroelectric power stations, fisheries and freshwater-intakes. The restoration was divided into using standard methods and developing new methods and materials. Thus: a pontoon bridge was built across the river; from the bridge adsorption material, Saneringsull, was blown out over the floating oil; oil-contaminated ice and snow was burned together with Saneringsull; the adsorbed oil was allowed to be frozen in the ice; the ice containing oil and adsorption materials was lifted to an ice-tip, later on the ice was melted; oil on free water surface was adsorbed. The adsorption material was spread from aircraft and boats; later on the adsorption material was transported to the shore and burned in incinerators; in order to protect the downstream area three types of booms were designed, no conventional boom could ever be used; every week water-samples were taken and analysed; and testfishing was performed in May 1972. The amount of oil one mile downstream from the last boom was never higher than 1 PPM and the fish did not contain any phenols or oils. The oil content of the surface water in the spill area and 5 miles downstream was, after the clean up job, at about 3 PPM which is normal for rivers during the timber-floating period. (See also W76-09312) (Sinha-OEIS)
W77-00255

TROPICAL STORM AGNES PENNSYLVANIA'S TORREY CANYON,
Environmental Protection Agency, Washington, D. C.
R. Kaiser, D. Jones, and H. Lamp'l.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 569-577, 7 fig.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Inland waterways, Water pollution, *Hurricanes, *Storms, *Pennsylvania, Equipment, Cleaning, Materials.
Identifiers: *Tropical Storm Agnes.

The 'Agnes Story' disaster as related to the largest inland oil spill experienced in the history of the U.S. and actions taken by EPA in coping with the problem are presented. The inland rivers of the Middle Atlantic area experienced spills of petroleum products ranging from over 3,000,000 gallons of No. 2 fuel oil, gasoline and kerosene from storage tanks in Big Flats/Elmira, N.Y. (just north of the Pennsylvania border) to 6,000,000-8,000,000 gallons of black, highly metallic waste oil and sludge from an oil reclamation plant on the Schuylkill River. The aftermath of this gigantic inland spill was oil and gasoline soaked fields, oil coated trees, farm houses, homes, factories, an airport and hundreds of stranded oil puddles, ponds and lagoons as the rivers receded to normal levels. Major spill effects and significant cleanup operations, problems encountered, and lessons learned are presented so that future responses can be better and more efficiently dealt with in an inland oil spill disaster comparable to the 'Agnes Oil Spill'. (See also W76-09312) (Sinha-OEIS)
W77-00256

LAKE CHAMPLAIN: A CASE HISTORY OF THE CLEANUP OF NO. 6 FUEL THROUGH FIVE FEET OF SOLID ICE AT NEAR-ZERO TEMPERATURES,
Environmental Protection Agency, Edison, N. J. Region II.
H. Lamp'l.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 579-582, 5 fig.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Pollution abatement, *Ice, Lakes, Cleaning, Materials, Equipment, Treatment.
Identifiers: *Lake Champlain, Fuel oil, Solid ice.

The removal of 44,000 gallons of No. 6 fuel from Lake Champlain in March, 1971, while the lake was frozen to a depth of five feet in the area affected by the spill is reported. The circumstances of the spill, the location and the adverse weather conditions presented a unique challenge to cleanup personnel in their quest to remove thick, viscous oil from a frozen, high-amenity lake. When confronted with this major spill (as classified by the National Contingency Plan) the cleanup personnel had no precedence upon which

ase their plan of attack. Improvisation was the eynote of the whole operation during the 'life' of is spill. Many novel ideas and techniques were ilized, not only to remove the oil, but to contain from further pollution the waters of Lake Chamain. (See also W76-09312) (Sinha-OEIS)
77-00257

UCCESSES AND FAILURES WITH OIL PILLS IN THE SOUTHEASTERN INLAND VATERS,
nvironmental Protection Agency, Atlanta, Ga. nvironmental Emergencies Branch.
. J. Smith.
n: Prevention and Control of Oil Spills, roceedings of Joint Conference, Washington, C, March 13-15, 1973. p 583-588, 4 fig, 5 ref.

escriptors: *Oil spills, *Oil pollution, *Water uality control, Water pollution, *Inland waterays, *Pollution abatement, *Environmental efcts, Water treatment, Southeast U.S.
lentifiers: Cleanup methods, Containment.

brief review of several spill cases that have ocrred in the Southeast in the recent past are resented. Each case describes a unique situationither in terms of containment, retention or moval methodology. At Athens, Georgia, a ipeline break caused the closure of the Athens ater Supply System for twenty-four hours. A ipeline break near Shepherdsville, Kentucky, rced some 16,000 gallons of crude oil into a subrface layer of gravel. Interception trenches were sed to tap the gravel layers and water was forced to the layer up the gradient in order to 'flush' the ystem. A vandalized storage tank adjacent to the ongaree River was emptied of 10,000 Bunker 'C' ear Columbia, South Carolina. Elaborate containent and recovery procedures were employed ownstream. The oil, however, disappeared--save r minor vegetation stain, and non reached the ecovery site. River velocity, wind speed, temerature of the water and turbidity are discussed s contributors to this phenomena. At Jackson, lississippi, a broken sludge pond dyke at a rilling operating dumped 40,000 gallons of 'oil ops' and brine into the Big Black River. Retenon on the surface was impossible because of the ght to ten knot river velocity. Light disposable rbing booms were used to recover an estimated 0% of the oil. Pictures and sketches are utilized to mphasize technical aspects of each situation. See also W76-09312) (Sinha-OEIS)
77-00258

N EFFECTIVE OIL SPILL CONTAINMENTECOVERY SYSTEM FOR HIGH SEAS USE,
xxon Co. U.S.A., Los Angeles, Calif.
L. Glaeser.
n: Prevention and Control of Oil Spills, roceedings of Joint Conference, Washington, C, March 13-15, 1973. p 589-596, 10 fig.

escriptors: *Oil spills, *Oil pollution, *Water uality control, Water pollution, *Pollution abateent, *Environmental effects, Oceans, Equipent, Materials, Tests, Weirs, Skimming, esources, Weather
lentifiers: *Outer Continental Shelf, Oil booms, il skimmers, Containment, *Oil recovery.

he development and testing of a new operational l spill containment-recovery system is discussed. nique designs incorporated into the system inude: (1) an oil spill containment barrier utilizing a Bottom Tension' concept to increase containment ffectiveness and survival strength; and (2) a wave mpensating, weir type skimmer system utilizing droplet formation process to recovery high scosity emulsions. A testing program has escribed the operational characteristics of the stem. The results of this program are presented. typical operational 'package' using the basic om and skimmer components is discussed. (See so W76-09312) (Sinha-OEIS)
77-00259

CASE STUDIES OF THE USN SUPERVISOR OF SALVAGE, SALVAGE RELATED OIL POLLUTION INCIDENTS,
Naval Ship Systems Command, Washington, D. C. Office of the Director of Ocean Engineering.
D. E. Irons.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 597-600, 3 fig.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Pollution abatement, Water pollution, Discharge(Water), Personnel training, Rivers, Harbors, Beaches, Islands.
Identifiers: *Outer Continental Shelf, Groundings, Collisions, Salvage.

The involvement of the U.S. Navy salvage forces in oil pollution control, prevention and cleanup of spills generated by ships damaged by fire, groundings, collisions and overboard discharge is described. The six cases discussed include oil pollution threats to a major river, a major harbor, a turtle sanctuary on an isolated western Pacific Island and the open ocean and the adjoining miles of beaches. Methods and equipments used to combat the spills are described in detail. The Navy salvage forces including world-wide pools and bases of back-up equipment are discussed. Training of Naval personnel in oil pollution abatement techniques and the use of the many and varied equipments and materials is described. The status of on-going research and development programs which provide improved methods and equipment to combat oil pollution is reported. (See also W76-09312) (Sinha-OEIS)
W77-00260

JET OIL RECOVERY DEVICE,
Griffiths (James) and Sons, Inc., Seattle, Wash.
J. K. Stewart.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 601-615, 23 fig.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Water pollution, *Pollution abatement, *Separation techniques, Treatment, Equipment, Prototype tests, Tests, Surface tension, Jets.
Identifiers: *Outer Continental Shelf, Deepsea, *Jet oil recovery.

The jet oil recovery device described causes contact of jet water streams with the recovered oil and separates the fluids within it. This concept involves the utilization of the surface tension characteristic of oil along with the hydraulic jet action to lift floating oil over a non-adjustable weir. A low pressure stream of water will carry with it an almost equal volume of contacted oil, depending on the type of oil, depth, jet angularity and outlet submersion, and other variable criteria. This paper is descriptive and findings reflect actual physical construction and tests only.)See also W76-09312) (Sinha-OEIS)
W77-00261

CODES OF PRACTICE FOR DEALING WITH OIL SPILLS AT SEA AND ON SHORE: A EUROPEAN VIEW
Institute of Petroleum, London (England).
L. R. Beynon.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 617-626, 10 tab.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Water pollution, *Pollution abatement, *Estuaries, Shores, Beaches, Absorption, Burning, Dispersion.
Identifiers: *Outer Continental Shelf, Crude oils, Fuel oil, Distillate fuels, Waxy oils, Bunker oil, Oil booms, Sinking, Pick-up.

Representatives of nine countries of Western Europe have been preparing codes of practice for dealing with oil spills at sea and those which have reached the shore. This paper describes the codes which have been produced. The codes set out the recommended methods, in order of priority, for six main 'location variables.' (1) Open or rough sea; (2) Open sea, close to shore; (3) Estuaries; (4) Sheltered, calm waters (including ports and harbors); (5) On shore; and (6) Ice conditions. The other main variables taken into accout are type and quantity of oil spilt. 'Oil type' has been subdivided into: (a) Crude oils which spread on contact with water; (b) Crude oils which have weathered on the sea; (c) Water-in-oil-emulsions; (d) Heavy fuel oils; (e) Distillate fuels; and (f) Waxy oils which tend to coagulate into lumps on contact with the sea. (See also W76-09312) (Sinha-OEIS)
W77-00262

QUANTITATIVE EVALUATION OF MECHANICAL OIL SPILL CLEANUP DEVICES,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
J. J. Der, and D. J. Graham.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 627-633, 3 fig, 5 tab, 3 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Water pollution, *Pollution abatement, Equipment, Tests, Cleaning, Weirs.
Identifiers: *Outer Continental Shelf, Oleophilic disks, Oleophilic belts, Saucer weir, Sorbents, Vortex weirs.

A systematic quantitative method has been developed which can be used for preliminary screening and with the availability of more accurate performance data, used for final evaluation and selection of candidate oil removal devices. This method has been applied to various types of devices available commercially. Although the lack of precision in available performance data precludes selection between devices with close rating, an outstanding score of a device under the present method is an indication of its potential for further study or development. The result shows that for confined area operation inverted belts and a saucer weir with hydro-adjusting feature have high potential. A system based on the mechanized recovery of polyurethane foam rated high for the open area operation. The effectiveness indices for all of the open area devices considered fall in a narrow range, however, and final selection must be based on more accurate data from field and wave tank tests. (See also W76-09312) (Sinha-OEIS)
W77-00263

OIL/SORBENT HARVESTING SYSTEMS FOR USE ON VESSELS OF OPPORTUNITY,
Woodard-Clyde Consultants, San Francisco, Calif. Envicon Div.
J. D. Sartor, and C. Foget.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 635-641, 9 fig, 3 tab.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, Water pollution, *Pollution abatement, Harvesting, Oceans, California, Equipment, Material, Tests.
Identifiers: *Outer Continental Shelf, Vessels of opportunity, Sorbents, Wire mesh belts, Straw.

A system for harvesting mixtures of oil and sorbent materials, primarily straw, which could be utilized for the recovery of floating oil from water was developed for use on vessels of opportunity. The first phase of the program involved testing individual system components and operating parameters as to their effectiveness in picking up sorbents only under actual conditions in a salt-water slough. The second phase entailed evaluat-

ing those operating characteristics of the harvesting system components selected in the first phase using crude oil and various sorbents in a test tank. The test program entailed the installation of the complete system on a vessel of opportunity (an LCM), and demonstration of the ability of the system to operate under actual conditions. The system was evaluated both in the San Francisco Bay and off Coal Oil Point, Santa Barbara where sorbent materials were dispensed over natural oil slicks. The system was found to be very effective in recovering sorbents (straw and polyurethane foam) from the water surface. (See also W76-9312)
W77-00264

USE OF THE MASSACHUSETTS DIP OIL SKIMMER ON FREE SLICKS IN THE CASCO BAY (PORTLAND) SPILL,
JBF Scientific Corp., Burlington, Mass.
R. A. Bianchi, E. E. Johanson, and J. H. Farrell.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 643-655, 19 fig.

Descriptors: *Oil spills, *Oil pollution, Water pollution, *Water quality control, Pollution abatement, *Skimming, Cleaning, Harvesting, Beaches, Massachusetts.
Identifiers: Oil slicks, *Casco Bay(MA), Fuel oil, *Oil skimmers, Oil booms, Straw, Debris.

On July 22, 1972, the tanker Tamano, carrying a full load of No 6 fuel oil, sustained a ruptured tank and reportedly spilled on the order of 100,000 gallons of oil in Casco Bay. For two weeks following the accident, the Tamano was anchored and surrounded by containment booms while its cargo was off-loaded and cleanup operations were performed. This paper describes the role newly developed Dynamic Inclined Plane (DIP) Skimmer played in the cleanup operation and presents observations and evidence of the need for, and effectiveness of, a mobile skimmer in large spill situations. The role of support vessels in maintaining the skimming operation and handling the collected liquids and solids is examined. The effective use of skimmers is demonstrated over a wide range of environmental conditions and the full range of oil debris conditions from the newly spilled, relatively clean oil to the weathered straw-seaweed-debris-laden material that exists after several days. The oil skimmer was secured to the side of several different vessels and used in a sweeping mode to collect heavy weathered No. 6 oil, oily straw, oily seaweed, and debris. Several conditions are presented including harvesting of windrows of oil and debris, harvesting thick oil in a free slick (in seas several feet high), and harvesting both thick oil and sheen leaking from a boom. The effectiveness of these operations is explored in terms of both pickup and transfer. (See also W76-09312) (Sinha-OEIS)
W77-00265

DEVELOPMENT OF METHODOLOGY AND APPARATUS FOR THE BIOASSAY OF OIL,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5A.
W77-00266

A REINVESTIGATION OF SOUTHERN CALIFORNIA ROCKY INTERTIDAL BEACHES THREE AND ONE-HALF YEARS AFTER THE 1969 SANTA BARBARA OIL SPILL: A PRELIMINARY REPORT,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W77-00267

THE RESPONSE OF MACROINVERTEBRATES TO GASOLINE POLLUTION IN A MOUNTAIN STREAM,
Environmental Protection Agency, Kansas City, Mo. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W77-00268

TERRESTRIAL OIL SPILLS IN ALASKA: ENVIRONMENTAL EFFECTS AND RECOVERY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5C.
W77-00269

A STUDY OF THE EFFECTS OF THE SAN FRANCISCO OIL SPILL ON MARINE ORGANISMS,
College of Marin, Kentfield, Calif.
For primary bibliographic entry see Field 5C.
W77-00270

INTERAGENCY INVESTIGATIONS OF A PERSISTENT OIL SPILL ON THE WASHINGTON COAST,
National Marine Fisheries Service, Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-00271

THE PHYSICAL OCEANOGRAPHY AND WATER QUALITY OF NEW YORK HARBOR AND WESTERN LONG ISLAND SOUND,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
D. A. Jay, and M. J. Bowman.
Technical Report No. 23, Reference No. 75-7, December 1975. 75 p, 21 fig, 9 tab, 110 ref, 3 append.

Descriptors: *Oceanography, *Water quality, *Sewage effluents, New York, *Water pollution sources, *Estuarine environment, *Transport, Salinity, Pollutants, Nutrients, Water resources, Circulation, Path of pollutants.
Identifiers: *New York Harbor, *Long Island Sound, New York Bight, Physical oceanography.

The literature on the tides, currents, hydrography and hydrology of New York Harbor from 1843 to date is reviewed. Particular emphasis is placed on the relationship between water, salt and pollutant transport mechanisms in the East River, the Harbor and western Long Island Sound. An estuarine circulation in the Upper East River modifies the hydraulic regime and transports Upper East River surface water toward Long Island Sound. The observed distributions of nutrients and sewage effluents suggest that the estuarine and dispersive mechanisms in theEast River transport a considerable fraction of sewage emptied into the East River to the Sound, while the advective component is expected to transport effluents into New York Harbor. Transport of sewage pollutants from the East River is probably a major factor causing the observed violations of state and federal water quality standards in western Long Island Sound. It is concluded that the East River, particularly the upper section, is a very poor location to release sewage effluents. (NOAA)
W77-00273

COASTAL ZONE BIBLIOGRAPHY: CITATIONS TO DOCUMENTS ON PLANNING, RESOURCES MANAGEMENT AND IMPACT ASSESSMENT, SECOND EDITION,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 2L.
W77-00277

ECONOMIC IMPACTS OF STATE ENVIRONMENTAL PROGRAMS IN A NATIONAL FRAMEWORK: THE IOWA CONSERVANC LAW,
Iowa State Univ., Ames. Center for Agricultur and Rural Development.
For primary bibliographic entry see Field 6G.
W77-00303

EFFECT OF PLOUGHING AND DIREC DRILLING ON SOIL NITRATE CONTENT,
Agricultural Research Council, Wanta (England). Letcombe Lab.
For primary bibliographic entry see Field 2G.
W77-00305

SHORT TERM NITRATE LOSSES AND A SOCIATED MICROBIAL POPULATIONS SOIL COLUMNS,
California Univ., Berkeley. Dept. of Soils a Plant Nutrition.
For primary bibliographic entry see Field 2G.
W77-00309

SOIL ORGANIC MATTER FRACTIONS SOURCES OF PLANT AVAILABLE SULPHUR
Commonwealth Scientific and Industrial Resear Organization, Canberra (Australia). Div. of Pl Industry.
For primary bibliographic entry see Field 2G.
W77-00310

A SYSTEMATIC PROCEDURE FOR TAXI AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. Agricultural Engineering.
W. R. Walker.
Engineering Mechanics Section, Civil and E vironmental Technology Program, Natio Science Foundation, Washington D.C. 20550. O tober 1975, 98 p, 12 tab, 22 fig, 33 ref.

Descriptors: *Model studies, Agricultu *Pollution charges(Taxes), *Colorado Ri Basin, *Taxes, Tax rates, *Salini *Methodology, Water quality control, Water p lution sources.
Identifiers: *Diffuse agricultural pollution, Gra Valley(Colo).

A methodology for taxing diffuse agricultural p lution sources is presented which is based up deriving linkages between three economic hydrologic modeling systems. The procedure volves modeling the hydro-quality system in agricultural area in order to identify the speci processes causing water quality degradati Then, these results are linked through a pollut coefficient to an economic externalities mo describing the detriments incurred by downstre uses of water with poor quality characteristi And finally, an input-output model is develop from which input coefficients and business tipliers are calculated as a means of assessing local economic impact of alternative taxing p cies. The Grand Valley in Western Colorado taken as the case study for this project since i one of the more significant sources of salinity the Colorado River Basin. The analysis evalua the potential for taxing agricultural croplands the valley as a means of controlling salinity rela damages in the lower Colorado River Basin. F groups of taxing strategies are investigated: directly attributable detriments, (2) per equivalent salt loading, (3) salinity or pollut coefficients, and (4) values of gross revenue acre. A discussion of how each tax could be plied is presented. (Skogerboe-Colo St)
W77-00314

ANNOTATED BIBLIOGRAPHY ON TRICK IRRIGATION,
Colorado State Univ., Fort Collins. Dept. Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-00315

TATUS REPORT ON ABATEMENT OF EF-LUENTS FROM THE CANADIAN PULP AND APER INDUSTRY -- 1974.
nvironmental Protection Service, Ottawa Ontario).
conomic and Technical Review Report No. EPS WP-75-6, December, 1975. 33 p, 3 fig, 11 tab.

escriptors: *Pollution abatement, *Pulp and per industry, *Canada, Water pollution control, ater pollution sources, Legislation, Investment, reatment facilities, Economics, Biological treat-ent, Energy, Costs, Sulfite liquors, Effluents, Pulp wastes, Water quality standards, Regula-n.
entifiers: Chemical recovery, Thermomechani-l pulping, Sulfite pulp mills, Newsprint mills.

egulations to limit the discharge of pollutants om Canada's pulp and paper mills were promul-ted in November, 1971. During 1969-1974, sig-ficant reductions in such discharges were hieved, even with the increased production. The ajority of mills are presently covered by com-iance programs, but further work must be done efore the minimum limits prescribed in the pulp d paper effluent regulations are achieved. Mills e encouraged to practice prevention rather than eatment. In the period 1969-1974, industry ex-enditures for abatement facilities amounted to 00,000,000. An additional $811,000,000 will be quired to achieve compliance in all mills. Ef-uent abatement at integrated newsprint/sulfite ills poses the most difficult problem. The instal-tion of abatement facilities, such as waste liquor covery furnaces and incinerators, may not be conomically feasible because of high capital osts. Alternative abatement measures, such as ological treatment, could involve high costs, as ell as increased energy requirements. One poten-al solution may involve consolidation of several nall mills into a larger operation, making liquor covery economically more attractive. Process anges, such as a switch to thermomechanical ulping, may be another solution. (Witt-IPC)
77-00331

ROSION AND RUNOFF ON FOREST AND ANGE LANDS,
orest Service (USDA), Ogden, Utah. Intermoun-in Forest and Range Experiment Station.
or primary bibliographic entry see Field 4C.
77-00332

ICROORGANISMS AS INDICATORS OF THE NVIRONMENTAL HYGIENE: ECOLOGY, AXONOMY AND ENUMERATION, (IN UTCH),
hent Rijksuniversiteit (Belgium). Inter-Faculty entre for Environmental Sanitation.
or primary bibliographic entry see Field 5A.
77-00348

YGIENIC PROBLEMS OF ENVIRONMENTAL ROTECTION IN CONNECTION WITH THE URTHER DEVELOPMENT OF SIBERIA AND HE FAR EAST, (IN RUSSIAN),
P. Shitskova.
ig Sanit 4, p 12-15, 1975.

escriptors: Asia, *Public health, *Environmental nitation, Natural resources, Water pollution, Air llution, Water quality standards, *Environment.
entifiers: Far-East, *Siberia, *USSR.

connection with the development of the natural sources and buildup of the industrial potential of beria, the Far East and the Far North of the SSR, environmental protection is discussed as a oad social hygienic problem encompassing im-ovement of working and living conditions, pro-tion of water resources, air, soil, and food oducts, noise control and other sanitary factors.-opyright 1976, Biological Abstracts, Inc.
77-00349

BIBLIOGRAPHY ON TIDAL HYDRAULICS, SUPPLEMENTARY MATERIAL COMPILED FROM MAY 1971 TO MAY 1974, ES 816, TIDAL FLOWS IN RIVERS AND HARBORS.
Committee on Tidal Hydraulics (Army), Washington, D.C.
For primary bibliographic entry see Field 2L.
W77-00353

SEABED DRIFTER MOVEMENT IN SAN DIEGO BAY AND ADJACENT WATERS,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5B.
W77-00356

A BALANCED REGIONAL INPUT-OUTPUT MODEL FOR IDENTIFYING RESPONSIBILITY FOR POLLUTION CREATED BY INDUSTRIES WHICH SERVE NATIONAL MARKETS,
State Univ. of New York at Binghamton. School of Management.
M. Chatterji.
International Regional Science Review, Vol. 1, No. 1, p. 87-94, 1975. 7 ref.

Descriptors: *Pollutant identification, *Input-output analysis, *Cost allocation, Cost transfer, Mathematical models, Spatial distribution, Regional economies, Pollution abatement, Environment, Management.

A balanced input-output model is designed to identify regional responsibility for pollution generation and control based on classification of production of useful goods as either local, regional, or national. Eleven equations produce a regional and national linkage of the output of the regional goods in the region with national final demand, the final demand of the region for regional goods, and the tolerable level of pollution final demand. If there is some change in any of the above exogenous factors, then the change in the output of the regional goods in the region can be calculated. The last two equations can be used for policy decisions, e.g., suppose a power plant must be constructed in a specific region. Then the responsibility for the pollution associated with its operations can be assigned relative to the two exogenous factors--national final demand, and final demand in the region, but only after adjustment is made for the acceptable level of pollution in the specified region. Similarly, the responsibility for the pollution from journey-to-work transportation and other regional activities can be related to the demand of that region and of all others. This analysis can be extended to pricing and value added by production. (Auen-Wisconsin).
W77-00382

THE INTEGRATION OF ENVIRONMENTAL AND DEVELOPMENT PLANNING FOR ECOLOGICAL CRISIS AREAS IN AFRICA,
Nairobi Univ. (Kenya). Dept. of Geography.
For primary bibliographic entry see Field 6G.
W77-00385

ENVIRONMENTAL FACTORS IN PRODUCING SUPPLEMENTAL FUELS,
For primary bibliographic entry see Field 6G.
W77-00390

EFFLUENT CHARGES AND POLITICAL REALITIES--A QUALIFICATION,
Pennsylvania State Univ., University Park. Dept. of Economics.
T. A. Ferrar, P. G. Sassone, and A. B. Brownstein.
Journal of Environmental Systems, Vol. 5, No. 2, p 95-101, 1975. 5 ref.

Descriptors: *Pollution taxes(Charges), *Efficiencies, *Equity, Economic impact, New York, *Political aspects, Legal aspects, Taxes, Legislation, Regulation.
Identifiers: *New York(NY).

The efficacy of pollution taxes as a pollution abatement tool is assessed, specifically in its application to New York City during the 1972 winter when it was faced with a shortage of low-sulfur content residual fuel oil. In order to minimize damage to the ambient environment yet avoid potential welfare loss, a general variance to the sulfur-content regulations was granted jointly with a surcharge. The implications of that approach are examined with the conclusion that the existence of a legally specified 'fairness principle' effectively prohibited the construction of an optimal effluent charge. It is also pointed out that a 'fairness' stipulation is the central feature of the Pure Air Tax Act of 1972. The economic character of the New York City effluent charge system is analyzed by a model and demonstrates that ethically satisfying restrictions effectively thwart efficiency properties of effluent charges since the marginal damage function depends on a variety of meteorological, topological, demographic, and other socioeconomic factors; thus the optimum user charge must vary within a given environmental management region in order to achieve the efficiency characteristics. The central point is that the restrictions mandated by the political-legal setting in New York City and the federal legislation refused to recognize these differences and hence fail in optimal resource allocation. (Auen-Wisconsin).
W77-00392

BASF COMPLETES TEN-YEAR PROJECT FOR CLEANING UP THE RHINE,
For primary bibliographic entry see Field 5D.
W77-00403

INTRODUCTION TO THE KNOWLEDGE OF FRESHWATER INVERTEBRATES AND THEIR ENVIRONMENT, (IN DUTCH),
Rijksinstituut voor Natuurbeheer, Leersun (Netherlands).
For primary bibliographic entry see Field 2I.
W77-00410

ROLE OF THE MUSSEL IN PURIFYING SEA WATER OF PETROLEUM PRODUCTS (IN EXPERIMENT), (IN RUSSIAN),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
E. V. Bioko, and Yu. M. Petrov.
Gidrobiol Zh. 11(2), p 28-33, 1975.

Descriptors: *Mussels, *Water purification, *Sea water, *Oil pollution, Oil spills, Oil wates, Organic compounds.
Identifiers: *Mytilus-Edulis.

The influence of Mytilus edulis on purification of seawater of petroleum products was studied under experimental conditions and quantitative indices determined. In aquariums with M. edulis, water is purified twice as fast as in the control (without animals). About 7% of the initial amount of petroleum product remains in the aquariums 3 wk after M. edulis is put into it; 1.4% of these products is settled by hydrobionts onto the bottom of the vessels, 5.6% remains in the surface film and about 0.2% is dissolved in the water. An assumption is made that chemical oxidation of oil starts 3 wk after its introduction.–Copyright 1976, Biological Abstracts, Inc.
W77-00418

THE VIEW OF THE PAPER INDUSTRY ON THE OCCURRENCE OF PCB'S IN THE ENVIRONMENT AND THE NEED FOR REGULATION,
Container Corp. of America, Carol Stream, Ill.
For primary bibliographic entry see Field 5B.
W77-00461

STATEMENT RELATING TO POLYCHLORINATED BIPHENYLS ON BEHALF OF THE WISCONSIN PAPER COUNCIL,
Bergstrom Paper Co., Neenah, Wis.
For primary bibliographic entry see Field 5B.
W77-00462

EROSION IN 1973-74: THE RECORD AND THE CHALLENGE,
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 2J.
W77-00471

EPA AND AGRICULTURE: ESTABLISHING A PARTNERSHIP,
Environmental Protection Agency, Washington, D. C.
R. E. Train.
Journal of Soil and Water Conservation, Vol. 30, No. 1, p 33-35. January-February, 1975.

Descriptors: *Agriculture, *Environmental control, *Environment, Pollution, Water quality, Ecology, Environmental effects, Pollution abatement.
Identifiers: *Environmental protection agency.

Pollutants often cross natural barriers or otherwise interact to exercise profound effects on the world environment. On the other hand, corrective action taken in one place may produce benefits in others as well. Fortunately, water pollution control and soil and water conservation require identical measures in most instances. The control of soil erosion, for example, though it cannot prevent the loss of some soluble compounds, does keep waterways free of sediments with their attached, insoluble pesticides and nutrients. And pollution control itself is a vital part of any water conservation project. (Skogerboe-Colo St)
W77-00472

INTERACTIONS BETWEEN ORGANIC COMPOUNDS, MINERALS, AND IONS IN VOLCANIC ASH DERIVED SOILS: I. ADSORPTION OF BENZOATE, P-OH BENZOATE, SALICYLATE, AND PHTHALATE IONS,
California Univ., Riverside. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-00473

INTERACTIONS BETWEEN ORGANIC COMPOUNDS, MINERALS, AND IONS IN VOLCANIC-ASH-DERIVED SOILS: II. EFFECTS OF ORGANIC COMPOUNDS ON THE ADSORPTION OF PHOSPHATE,
California Univ., Riverside. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-00474

EFFECT OF AGRICULTURAL DRAINAGE ON WATER QUALITY,
Virginia Polytechnic Inst. and State Univ., Blackstone. Southern Piedmont Center.
For primary bibliographic entry see Field 5B.
W77-00475

IOWA'S EXPERIENCE WITH A MANDATORY SEDIMENT CONTROL LAW,
Iowa Dept. of Soil Conservation, Des Moines.
For primary bibliographic entry see Field 6E.
W77-00477

NITRATE REDUCTION AND NITRITE UTILIZATION BY NITRIFIERS IN AN UNSATURATED HANFORD SANDY LOAM,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5B.
W77-00478

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE USE OF CONTINUOUS SIMULATION IN THE EVALUATION OF WATER QUALITY MANAGEMENT PLANS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W77-00001

APPLICATION OF A HYDROLOGIC MODEL TO THE PLANNING AND DESIGN OF STORM DRAINAGE SYSTEMS FOR URBAN AREAS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W77-00004

OPTIMAL DESIGN OF SINGLE RESERVOIR SYSTEM USING (DELTA) RELASE POLICY,
California Polytechnic State Univ., San Luis Obispo. Dept. of Computer Science and Statistics.
For primary bibliographic entry see Field 4A.
W77-00109

A RELIABILITY ASSESSMENT FOR REGIONAL WATER QUALITY MANAGEMENT,
Texas Univ., San Antonio. Div. of Environmental Studies.
For primary bibliographic entry see Field 5G.
W77-00114

OR DATA BASE INTERFACE--AN APPLICATION TO POLLUTION CONTROL,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W77-00116

ECONOMIC OPTIMUM RECORD LENGTH,
Nielsen and Rauschenberger A/S, Lyngby (Denmark).
For primary bibliographic entry see Field 4A.
W77-00117

ENVIRONMENT, ENERGY, AND CAPITAL IN THE FOSSIL FUELED ELECTRIC POWER INDUSTRY,
Houston Univ., Tex.
For primary bibliographic entry see Field 3E.
W77-00118

A COMPUTERIZED SYSTEM FOR WILD LAND USE PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 6G.
W77-00119

OPTIMIZATION OF STATE WATER QUALITY MONITORING SYSTEMS,
Environmental Research Lab., Corvallis. Oreg.
For primary bibliographic entry see Field 5G.
W77-00120

THE USE OF STOCHASTIC MODELS IN THE INTERPRETATION OF HISTORICAL DATA FROM SEWAGE TREATMENT PLANTS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5D.
W77-00121

WEATHER-DEPENDENT PRICING FO WATER RESOURCES IN THE TEXAS HIGH PLAINS,
International Bank for Reconstruction an Development, Washington, D. C.
For primary bibliographic entry see Field 3F.
W77-00122

A STABLE ESTIMATOR FOR LINEA MODELS I. THEORETICAL DEVELOPMEN AND MONTE CARLO EXPERIMENTS,
Pavia Univ. (Italy).
For primary bibliographic entry see Field 4A.
W77-00123

A METHOD FOR SELECTING AND EVALUA ING SIMULATION GAMES AS EDUCATIONA TOOLS FOR WATER RESOURCES PLANNIN
Massachusetts Univ., Amherst. Water Resourc Research Center.
L. G. Lockwood, and R. F. Powers.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-258 85
Price codes: A05 in paper copy, A01 in microfich
WRRC Pub. No. 74, Completion Report FY-76-1
June 1976. 81 p, 116 ref. OWRT A-072-MASS(
14-34-0001-6022.

Descriptors: Water resources, *Plannin *Methodology, Education, Design criteri Evaluation, *Simulation analysis.

Objectives were to: (1) develop a methodology f evaluating role-playing simulation games as trai ing devices for students and practitioners in e vironmental fields; (2) apply this methodology selected role-playing simulation games current employed or proposed for employment in t water resources fields; and (3) recommend crite for selection of simulation games for uses in t water resources fields. Each objective was su cessfully met, and a new methodology for t selection and evaluation of educational simulati games in the environmental fields was develope The methodology should be applicable to a wi range of educational simulation game, a facilitate the statement and clarification of instru tional objectives for these games. A comprehe sive analytical framework is provided for exam ing the major dimensions of a simulation ga which include the following: (1) instructional o jectives; (2) practical aspects; (3) design chara teristics; (4) degree of reality; and (5) degree complexity.
W77-00148

A BALANCED REGIONAL INPUT-OUTPU MODEL FOR IDENTIFYING RESPONSIBILI FOR POLLUTION CREATED BY INDUSTRI WHICH SERVE NATIONAL MARKETS,
State Univ. of New York at Binghamton. Sch of Management.
For primary bibliographic entry see Field 5G.
W77-00382

6B. Evaluation Process

THE USE OF CONTINUOUS SIMULATION THE EVALUATION OF WATER QUALI MANAGEMENT PLANS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W77-00001

DAMS AND PEOPLE: GEOGRAPHIC IMPA AREA ANALYSIS,
Kentucky Water Resources Research Inst., L ington.
V. E. Arnett, and S. Johnson.
Available from the National Technical Infor tion Service, Springfield, VA 22161 as PB-258 8
Price codes: A07 in paper copy, A01 in microfic

search Report No. 97, September 1976. 122 p, tab, 33 ref. OWRT A-056-KY(1). 14-31-0001-7.

scriptors: Community development, *Social ects, *Social impact, Social change, Planning, ultiple-purpose reservoirs, *Attitudes, Water ources development, Regions, Regional analy-, *Kentucky, Environmental effects.
ntifiers: *Impact area analysis.

attempt is made to determine the efficacy of ng geographic impact areas as analytical sub-ups for the assessment of the impact of multi-rpose reservoir projects on target communities. e impact areas utilized are: the take area; the ow-the-dam area; the urban area; and, the ad-ent area. Each area is described in detail and ch is analyzed for differences in knowledge, evious experience, and perception of impact on nmunity and family. Data originated from uctured and open-ended interviews in Johnson unty, Kentucky. Information was collected dur-two field efforts, in February, 1974, and in Au-st 1974. Frequency of response and content alysis are the chief analytical devices. Descrip-ns of the life styles of each region indicated sig-icant differences exist between impact areas. In dition, findings concerning the key variables of owledge, previous experience, and perception impact support the efficacy of impact area anal-s. Different impact areas represent different entations to reservoir projects. These dif-ences must be considered for a better un-rstanding of the social impact of such reservoir ojects. (Huffsey-Kentucky)
77-00008

BAN SLUDGE DISPOSAL OR UTILIZATION TERNATIVES, SOCIO-ECONOMIC FAC-ORS,
vironmental Protection Agency, Philadephia, Region III.
r primary bibliographic entry see Field 5E.
77-00013

TER-PLAN COMMUNICATION AND OTIVATION STUDY, FINAL REPORT, ORIDA BACKGROUND STUDY,
erry Urban Science Center, Washington, D.C.
ailable from the National Technical Informa-n Service, Springfield, VA 22161 as PB-242 181, ce codes: A09 in paper copy, A01 in microfiche.
pared for National Science Foundation, shington, D. C., Experimental Research and velopment Incentives Office, November 30, 73. 191 p, 14 fig, 7 tab, 7 append.

scriptors: *Decision-making, *Planning, ommunications, *Motivation, *Institutional straints, *Management, *Florida, Legislation, vernment, Land use, Solar radiation, Regional velopment.
ntifiers: Tampa Bay Region(FL), Planned Unit velopments(PUDs), Regionalism, Solar energy.

s 6 month study looked into factors which inish success of innovative public programs l inhibit private investment in helping to solve blic sector problems. It focused upon communi-ion and motivation of key decision makers in vate and public sectors in and around the npa Bay region. Examples of successful and ing projects were analyzed. Study concludes t success of innovative programs is inhibited by c of understanding of the overall effort and un-ar definitions of responsibility, lack of packag-individual innovations into decision alterna-s, lack of support for innovations, and lack of ut by end-product users. Examples of each of se are given including regional development ef-s, solar energy projects, planned unit develop-nts, and legislation efforts. An experiment with goal of promotion of innovation in the public tor is described. A statewide program, velopments of Regional Impact, has been chosen because of its spatial and temporal characteristics. Major organizational elements of the experiment are a joint public-private sector committee to improve evaluation methods, an office of experiment management charged with technical control of the entire experiment, and introduction of certain brokerage functions. A successful brokerage undertaking would involve bringing together appropriate technology, planning and defining responsibilities of key people, supporting available innovation, and communicating meaningful information. Results of the experiment may provide useful information for policy guidance in areas of land use planning, environmental protection, revenue sharing, comprehensive planning and regionalism, and Federal-State relationships. (Smith-North Carolina)
W77-00098

AN OVERVIEW OF THE IMPACT STUDY OF THE MCCLELLAN-KERR MULTIPLE PURPOSE ARKANSAS RIVER SYSTEM,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6G.
W77-00101

SOCIAL IMPACT ASSESSMENT: AN OVERVIEW,
Colorado State Univ. Fort Collins.
E. Vlachos, W. Buckley, W. J. Filstead, S. E. Jacobs, and M. Maruyama.
Prepared for US Army Engineer Institute for Water Resources, Fort Belvoir, VA. December 1975. 117 p, 17 fig, 3 tab, 75 ref. DACW31-74-C-0134 to 0139.

Descriptors: *Social impact, *Social aspects, *Water resources development, *Evaluation, Analytical techniques, *Methodology, Decision making, Social values, Alternative planning, Cost-benefit analysis, Methodology.
Identifiers: *Impact assessment.

Methodological approaches to social impact assessment of water resources projects are discussed. A framework is set forth to carry out such analysis without prescribing rigid formulas. Topics such as the types of social scientists needed to carry out an assessment, useful theories the general orientation of water resources development, are discussed in sufficient detail to give a good start in doing an impact assessment. Four major areas are discussed: Human Community, Methods, Assessment and Evaluation, and Management Considerations. In Human Community, the range of problems encountered when trying to translate the real world into theories, models and paradigms is discussed. Data are difficult to obtain; simplifying assumptions are needed; and models are difficult to validate. In order to carry out assessment a policy and a framework are needed. This can be generated by answering questions such as: What goal values are to be sought.; What are the trends in the realization of water resources values.; and What broad physical and non-physical factors condition such trends. The Methods chapter gives information on social science methodology, data gathering and sources, data organization, and forecasting. Assessment, as distinct from impact analysis, must include someone's evaluation of perceived effects, or alternative actions, and of options expressed in diversified scenarios. As such, evaluative methods must deal with multiple objectives, provide flexibility, and include both monetary and non-monetary aspects for each alternative. A summary lists recommendations, including a series of pilot sites, a state-of-the-art study in specific situations, and a long range research plan. (Smith-North Carolina)
W77-00103

PENNSYLVANIA TRIES NEW WATER QUALITY MANAGEMENT PLAN,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 5G.
W77-00107

THE RELEVANCE OF TECHNOLOGICAL CHANGE IN LONG TERM WATER RESOURCE PLANNING,
Colorado Univ., Boulder. Dept. of Economics.
R. G. Kraynick, and C. W. Howe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 719, Price codes: A04 in paper copy, A01 in microfiche.
Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 74, October 1976. 51 p, 5 fig, 8 tab, 24 ref. OWRT A-022-COLO(1).

Descriptors: *Long-term planning, *Cost analysis, Statistical methods, Construction costs, Risks, *Economies of scale, Water supply development, Technology.
Identifiers: *Technological change, Geologic reconnaissance, Cost overruns, Optimal scheduling.

The major part of the investigation derives trends of real unit costs associated with major sub-project tasks of large-scale water projects. Data from U.S. Bureau of Reclamation water supply projects from 1935 to 1970 show that real unit costs of large-scale excavation and other construction operations have declined significantly, but the separation of static scale economy effects from the effects of true technological change poses a difficult problem. A second analysis examines how technological advances may contribute to the reduction of physical and engineering uncertainties in project construction and operation. A specific instance is geologic reconnaissance activities used in water project implementation, an activity which has benefitted from great technological advance in the post-war period. Data from U.S. Bureau of Reclamation projects show that there exists a statistically significant negative relationship between expenditures on reconnaissance investigations and geologically related construction cost overruns and post construction failures. The returns to geologic reconnaissance appear to have improved over time, suggesting significant technological improvement. Lastly, a dynamic investment planning model was utilized to determine the impact which inclusion of technological change as manifested in rates of change of the costs of various technologies would have on an optimal scheduling of projects in water supply system development. The results indicate that while some of the low historical rates of real cost reduction have been too low to affect the optimum sequencing of projects, rates well under 1% per annum can significantly change the optimum sequence of projects and the present value of system net benefits.
W77-00113

A METHOD FOR SELECTING AND EVALUATING SIMULATION GAMES AS EDUCATIONAL TOOLS FOR WATER RESOURCES PLANNING,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W77-00148

EFFECTIVENESS OF INFORMATION TRANSFER THROUGH WATER RESOURCES RESEARCHER/USER GROUP INTERACTION,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 10D.
W77-00151

A CASE STUDY OF CITIZEN PARTICIPATION IN RESOURCE PLANNING: THE CRAWFORD COUNTY CRITICAL RESOURCE INFORMATION WORKSHOP.
Wisconsin Univ., Madison. Inst. for Environmental Studies.

IES Report 44, January 1975. 61 p. 12 fig., 4 tab., 8 ref.

Descriptors: *Census, *Social participation, *Natural resources, Planning, Methodology, *Wisconsin, Agriculture, Forests, Wildlife, Wetlands, Grasslands, Land use, Geology, Social aspects, History, Scenery, Minerology, Water resources.
Identifiers: Critical Resource Information Program, Crawford County(Wis), Delbecq Nominal Group Technique, Delphi method.

The Critical Resource Information Program (CRIP), intended to define and inventory the critical resources of the state of Wisconsin, was tested in Crawford County. CRIP offers a means of identifying, locating, and assessing the high quality resources in the state, though it will not provide a complete resource inventory. Ten resource categories were chosen for investigation: minerals; special geologic features; agricultural land; water; cultural, historical, architectural or archeological features; forests; wildlife; scenic areas; wetlands; and grasslands. One of the major needs of CRIP is to obtain local perspectives of these resources. This was accomplished in Crawford County through the use of the Delbecq Nominal Group Technique, a combination of the Delphi and brainstorming methods. Approximately 45 participants were chosen by University Extension agents and key resources personnel in the County to work in small workshops on each of the resource categories. Resource areas were identified and weighed. The findings are reported and an independent assessment of potentially critical areas is included for those resource categories (agricultural lands, minerals, and wildlife) where generally available data make it possible. A set of detailed maps were prepared based on the discussions, and given to the County Board. (Luedtke-Wisconsin)
W77-00171

WATER PROBLEMS AND PROPERTY RIGHTS--AN ECONOMIC PERSPECTIVE,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
C. D. Ditwiler.
Natural Resources Journal, Vol. 15, No. 4, p. 663-680, 1975. 6 ref.

Descriptors: *Water allocation(Policy), *Water rights, *Economic efficiency, Water management(Applied), Riparian rights, Appropriation, Pueblo water rights, Usufructuary right, Costs, Benefits, Water supply, Water demand, Water utilization, Public rights.
Identifiers: Correlative water rights.

Significant property rights questions with respect to water are discussed from an economic perspective. The major problem considered is the efficient use of water, which is dependent upon the water allocation or transfer mechanism. This mechanism effects the quantity and mix of goods and services produced by a society as well as the distribution of wealth. It should allocate water resources between alternative users and over time in such a way that an equal value is obtained from the marginal units of all uses. Riparian, appropriative, correlative, pueblo, public ownership, and usufructuary water rights systems relevent to water allocation and use are discussed. Existing water law allocation/transfer criteria include: beneficial use; use preference; temporal priority; non-regulated uses over regulated uses; pre-permit uses over permit uses; priority with respect to source of water; priority of minimum or base flows over permit uses; economic consumptive use over physical consumptive use; and no injury proviso. Alternative approaches, including both planned and unplanned change, are set out along with some elements of the costs and benefits of achieving these respective changes. (Luedtke-Wisconsin).
W77-00174

BALANCING ENVIRONMENTAL QUALITY, ENERGY USE, AND GROWTH: DIFFICULT DECISIONS,
Energy Reserach and Development Administration-Fossil Energy, Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-00175

OFFSHORE INDUSTRIAL-PORT ISLANDS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5G.
W77-00176

CONCEPTUAL FRAMEWORK OF ENVIRONMENTAL MANAGEMENT,
Cleveland Dept. of Public Utilities, Ohio. Div. of Utilities Engineering.
For primary bibliographic entry see Field 6G.
W77-00178

USING LINEAR PROGRAMMING TO EVALUATE AGRICULTURAL FLOOD CONTROL PROJECTS,
Economic Research Service, Berkeley, Calif. Natural Resource Economics Div.
For primary bibliographic entry see Field 3F.
W77-00180

THE BUDDING ENVIRONMENTAL CLEAN-UP (A VIEWPOINT): PART I. POLLUTION AND ENVIRONMENT,
Bordeaux-I Univ., Talence (France). Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-00194

FISHERIES MANAGEMENT AND SOCIAL CONTEXT: THE CASE OF THE MAINE LOBSTER FISHERY,
National Marine Fisheries Service, Washington, D. C. Fisheries Management Div.
J. M. Acheson.
Transactions of the American Fisheries Society, Vol. 104, No. 4, p. 653-668, 1975. 13 ref.

Descriptors: *Fish management, *Social aspects, *Institutional constraints, Attitudes, Lobsters, Political aspects, *Maine, Legislation, *Marine fisheries, Social aspects.
Identifiers: Cultural aspects.

The necessity for considering basic social and cultural aspects of fishing communities along with the fisheries resource itself in promoting fisheries management schemes is argued. Forty-eight Maine lobster fishermen were interviewed to discover what types of biologically viable management strategies would solve their over-fishing problems and would be acceptable to the fishing industry. Five kinds of management proposals designed to decrease fishing effort are discussed against the background of certain key institutional features of these coastal communities. Social and cultural features examined include the idea of territoriality, the harbor gang or social reference group, the emphasis on fairness and equal use of resources, and the dislike of part-time fishermen. Results suggest that attempts to decrease fishing effort by a moratorium on fishing, by taxation, or by biological controls such as raising the legal carapace size, would be strongly resisted. On the other hand, a trap limit and a limited entry licensing scheme would be consistant enough with some institutional features, such as territoriality, that they would receive considerable political support. In general, they tend to favor legislation that will either increase or not effect their income, or that formalizes cultural institutions already in existence. (Luedtke-Wisconsin)
W77-00383

THE INTEGRATION OF ENVIRONMENT AND DEVELOPMENT PLANNING F ECOLOGICAL CRISIS AREAS IN AFRICA,
Nairobi Univ. (Kenya). Dept. of Geography.
For primary bibliographic entry see Field 6G.
W77-00385

BLUE GOLD: MARICULTURE OF THE E BLE BLUE MUSSEL (MYTILUS EDULIS),
Harvard Univ., Cambridge, Mass. Administrat Services.
For primary bibliographic entry see Field 6C.
W77-00386

EVALUATION OF RECREATIONAL SITES,
Clemson Univ., S. C. Dept. of Forestry.
C. L. Lane, W. P. Byrd, and H. Brantley.
Journal of Leisure Research, Vol. 7, No. 4, p. 300, 1975. 2 tab., 9 ref.

Descriptors: *Recreation, *Sites, *Attitu *Evaluation, Methodology, Photography, *Sc Carolina, *Recreation facilities, Social aspects.

In an attempt to evolve a labor and cost sa method of determining recreational preferences, color slides were presented to groups of resource-oriented students at Clem University, South Carolina. Each group visited and evaluated the respective sites pr ously. The preference of a site when viewed slides differed significantly from preference on actual viewing of the site. The sites were r differently by the five student groups resulting significant student section-by-site interaction. study was initiated on the assumption that the of panoramic color slides would be a real method of determining preferences of large n bers of students in a short period of time. H ever, when compared to on-site viewing, method of presentation indicated that it was n reliable means of determining preferences. E though the students will be resource managers were therefore more homogeneous than a sa of the total population all groups did not score sites the same. Consequently, determining the preference of a heterogeneous cross section o general population by photographic meth would be unrealistic. (Auen-Wisconsin)
W77-00387

DECISION-MAKING IN RECREATIO FISHERIES MANAGEMENT: AN ANALYSIS
Virginia Polytechnic Inst. and State U Blacksburg. Dept. of Fisheries and Wil Sciences.
J. E. Powers, R. T. Lackey, and J. R. Zuboy.
Transactions of the American Fisheries Soc Vol. 104, No. 3, 630-634, 1975. 1 fig., 28 ref.

Descriptors: *Decision making, *Fish man ment, *Computer programs, *Methodol Fisheries, Recreation, Planning.
Identifiers: *Recreational fisheries.

A computer-oriented model is proposed to s matize the decision-making process in recreati fisheries management. The model reduces a c plex process into tangible segments so that a of weakness may be identified, then it is red to solvable componets. Step 1 selects the man ment objectives--the key point in the process method of selection is described. Step 2 is a sessment whether the selected objectives are Step 3 surveys alternative strategies. Step 4 e ates alternative strategies; Step 5 defines wh the objectives are reachable, with sub-step 5- determine whether research is needed to dev or evaluate a potential management solution. final Step 6, implements the best strategy. decision process should be continued by mon ing to determine if the management strategy i fective, and the entire decision-making pro must be continually re-evaluated. (Auen-Wis sin)
W77-00391

C. Cost Allocation, Cost Sharing, Pricing/Repayment

OMPUTER EVALUATION OF SLUDGE HAN-LING AND DISPOSAL COSTS,
nicipal Environmental Research Lab., Cincin-ti, Ohio.
r primary bibliographic entry see Field 5D.
77-00012

VIEW OF THE MUNICIPAL WASTE ATER TREATMENT WORKS PROGRAM,
vironmental Protection Agency, Washington, C. Construction Grants Review Group.
r primary bibliographic entry see Field 5D.
77-00043

MOVAL VS BENEFITS: IT CAN BE TOO STLY,
nsas City Water and Pollution Control Depts.,
r primary bibliographic entry see Field 5D.
77-00044

SCOUNTED CASH FLOW ANALYSIS TO LECT EQUIPMENT,
tech Corp., Dumont, N. J.
r primary bibliographic entry see Field 5D.
77-00049

NUTRIENT REMOVAL WORTHWHILE,
wa State Univ., Ames. Dept. of Animal Ecology.
r primary bibliographic entry see Field 5D.
77-00065

WERING THE CITY OF NEW YORK,
w York City Environmental Protection Ad-nistration.
r primary bibliographic entry see Field 5D.
77-00070

AINE SEWER BID 39% BELOW ESTIMATE.
r primary bibliographic entry see Field 5D.
77-00071

OVERVIEW: SO YOU WANT TO RECYCLE UR WASTEWATER. HOW SHOULD YOU GIN. IS IT FEASIBLE,
r primary bibliographic entry see Field 5D.
77-00079

IE RELEVANCE OF TECHNOLOGICAL IANGE IN LONG TERM WATER RESOURCE ANNING,
lorado Univ., Boulder. Dept. of Economics.
r primary bibliographic entry see Field 6B.
77-00113

VIRONMENT, ENERGY, AND CAPITAL IN E FOSSIL FUELED ELECTRIC POWER IN-STRY,
uston Univ., Tex.
primary bibliographic entry see Field 3E.
7-00118

ATHER-DEPENDENT PRICING FOR TER RESOURCES IN THE TEXAS HIGH AINS,
ernational Bank for Reconstruction and velopment, Washington, D. C.
primary bibliographic entry see Field 3F.
7-00122

PING WITH INCREASING COSTS,
ck and Veatch, Kansas City, Mo.
primary bibliographic entry see Field 3D.

W77-00172

A REGIONAL MARKET FOR RIGHTS TO USER FERTILIZER AS A MEANS OF ACHIEVING WATER QUALITY STANDARDS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-00173

MARINE SAND AND GRAVEL MINING,
Geological Survey, Menlo Park, Calif. Conservation Div.
For primary bibliographic entry see Field 3E.
W77-00195

ECONOMICS OF INCREASED MOBILITY FROM TILE DRAINAGE,
Mosul Univ. (Iraq). Coll. of Engineering.
For primary bibliographic entry see Field 3F.
W77-00313

A SYSTEMATIC PROCEDURE FOR TAXING AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-00314

A BALANCED REGIONAL INPUT-OUTPUT MODEL FOR IDENTIFYING RESPONSIBILITY FOR POLLUTION CREATED BY INDUSTRIES WHICH SERVE NATIONAL MARKETS,
State Univ. of New York at Binghamton. School of Management.
For primary bibliographic entry see Field 5G.
W77-00382

BLUE GOLD: MARICULTURE OF THE EDIBLE BLUE MUSSEL (MYTILUS EDULIS),
Harvard Univ., Cambridge, Mass. Administrative Services.
C. G. Hurlburt, and S. W. Hurlburt.
Marine Fisheries Review, Vol. 37, No. 10, p. 10-18, 1975.

Descriptors: *Aquiculture, *Shellfish farming, *Mussels, Europe, Coasts, Economic feasibility, Growth rates, United States, Methodology, Byproducts, Marketing.
Identifiers: *Mytilus edulis, France, Netherlands, Spain, Mussel mariculture, Depuration.

The high nutritional value and the feasibility of mussel (Mytilus edulis) mariculture is discussed. In Europe mussels are grown in different ways depending on the coastal geography and heights of tides. In northwest Spain, ropes are attached to rafts and extend about 30 feet down. Young seed mussels are collected and wrapped on the ropes until they become attached. They require 12-18 months to mature. An acre produces over 250,000 pounds of meat annually. A pole or 'bouchet' method is used along the Atlantic coast of France. Growth requires 12-18 months. An acre will yield over 4000 pounds of meat annually. In the Netherlands mussels are grown on the bottom of shallow, enclosed seas, but harvesting, cleaning, and storage is mechanized. About 20 months is required for their growth. An improved mechanized method for cleaning and storage is being developed in the Netherlands. Over 15,000 pounds of meat per acre are produced annually. Mussel culture can easily be adapted to the United States, depending on geographic and tidal conditions. Cubic, submerged growth, as in Spain, gives the best yields. Mussels are a very efficient producers of edible flesh. It could be the cheapest, most nutritious, and most abundant meat supply in the world. (Buchanan-Davidson--Wisconsin).
W77-00386

FORECASTS OF ATLANTIC AND GULF MENHADEN CATCHES BASED ON THE HISTORICAL RELATION OF CATCH AND FISHING EFFORT,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
W. E. Schaaf, J. E. Sykes, and R. B. Chapoton.
Marine Fisheries Review, Vol. 37, No. 10, p. 5-9, 1975. 1 fig., 2 tab., 18 ref.

Descriptors: *Forecasting, *Marine fisheries, *Fish harvest, *Atlantic menhaden, Fishing, Gulf of Mexico, Atlantic Ocean, Mathematical models.
Identifiers: *Gulf menhaden.

A multiple regression equation employing the empirical relation between catch and fishing effort estimates the annual catch. The total catch was used because (1) for the Atlantic fishery it is difficult to prorate effort on different ages, and (2) for the Gulf, aging is more uncertain; but there are fewer age classes in the fishery. The multiple regression used accounted for 85% of the variance in the Atlantic catches and 86% in Gulf catches. Observed Atlantic catches deviated from the forecasts by 9% in 1973 and 22% in 1974. The errors for the Gulf were 2% in 1973 and 1% in 1974. A measure of the incoming year class would permit development of short-term fishing strategies to take advantage of exceptional year classes or to prevent overexploitation of weak year classes. The model represents a progress report as other models, including more variables, are being considered. (Auen-Wisconsin)
W77-00388

STATUS OF THE GULF AND ATLANTIC MANHADEN FISHERIES AND IMPLICATIONS FOR RESOURCE MANAGEMENT,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
W. B. Schaff.
Marine Fisheries Review, Vol. 37, No. 9, p. 1-9, 1975. 5 fig., 3 ref.

Descriptors: *Marine fisheries, *Atlantic manhaden, *Fish management, Planning, Fish harvest, Fishing, Fish populations, Regulation, Commercial fishing, Model studies, Return(Monetary), Gulf of Mexico, Atlantic Ocean.
Identifiers: *Gulf menhaden.

The knowledge of the Atlantic and Gulf menhaden fisheries is summarized together with their problems. Some tentative solutions are offered and those problem areas which preclude an optimal management plan are indicated. The thrust of the discussion is toward the biological aspect of the resource and its response to harvesting at various intensity levels, as related to the total yield and the yield per unit of fishing effort. While catch limitations are the easiest to implement and will achieve the maximum sustainable yield (MSY), from the economic rationale it is necessary to limit the amount of effort and to do so in a manner that does not deter harvesting efficiency. In view of the technical difficulties of implementing any management scheme, the policy difficulties in determining an optimum strategy, and the inherent volatility of many fisheries, the option is to attain minimal objectives with a quota system as an initial step. Setting annual quotas, with adjustments in response to fluctuations in the size of incoming classes, would allow the industry to approach the peak of production systematically and gradually. Effort would be closely monitored each year to help determine the validity of the estimated MSY. This first management step would prevent both overfishing and economic difficulties for the industry, while other management plans are optimized. (Auen-Wisconsin)
W77-00389

EFFLUENT CHARGES AND POLITICAL REALITIES--A QUALIFICATION,
Pennsylvania State Univ., University Park. Dept. of Economics.

For primary bibliographic entry see Field 5G.
W77-00392

THE COST OF PHYSICAL CHEMICAL TREATMENT (PCT) WASTE WATER,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
For primary bibliographic entry see Field 5D.
W77-00445

CENTRIFUGE PLUS LIME LIMITS LIGNIN IN WASTE WATER,
For primary bibliographic entry see Field 5D.
W77-00464

ENVIRONMENTAL CONSIDERATIONS IN EXPANDING AGRICULTURAL PRODUCTION,
Latin American Program for Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-00470

6D. Water Demand

DIGITAL SIMULATION OF A BASALT AQUIFER SYSTEM, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4B.
W77-00481

CHANGES IN THE WATER SUPPLY IN THE UPPER REPUBLICAN NATURAL RESOURCES DISTRICT, SOUTHWEST NEBRASKA, FROM 1952-75,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4B.
W77-00489

6E. Water Law and Institutions

INSTITUTIONAL PROBLEMS OF THE SMALL TREATMENT PLANT,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W77-00010

INTER-PLAN COMMUNICATION AND MOTIVATION STUDY, FINAL REPORT, FLORIDA BACKGROUND STUDY,
Sperry Urban Science Center, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-00098

SOME THOUGHTS ON ZERO DISCHARGE,
Monroe County Drain Commission, Mich.
For primary bibliographic entry see Field 5G.
W77-00125

WATER PROBLEMS AND PROPERTY RIGHTS--AN ECONOMIC PERSPECTIVE,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-00174

MANAGEMENT OF THE OCEAN'S LIVING RESOURCES: AN ESSAY REVIEW,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
D. L. Alverson.
Ocean Development and International Law Journal, Vol. 3, No. 2, p. 99-125, 1975. 15 ref.

Descriptors: *Law of the Sea, *Marine fisheries, Resource allocation, Law enforcement, *Oceans, Jurisdiction, International waters, Institutions, Governments, *Management, Legal aspects, Political aspects, Fish harvest, Optimization.

A series of Resources for the Future (RFF) and American Society of International Law (ASIL) publications are reviewed to provide an overview and perspective on the management of the ocean's living resources in connection with the Third United Nations Conference on Law of the Sea. The six RFF papers are all oriented toward the theme of alternative arrangements for managing marine fisheries, while the ASIL report proposes eight principles as a rational basis for constructing a new international fisheries regime. Problems discussed are grouped under four areas: technical, legal and institutional, enforcement, and conference-associated. Technical problems considered are the (1) mobility of fisheries resources, (2) dynamic nature of marine fisheries resources, (3) ecological and harvesting gear interactions, (4) cost and difficulty acquiring credible biological and statistical information, and (5) communication failures between technical disciplines and between the scientific community and decision makers. Legal and institutional problems considered are: (1) No satisfactory right of property, (2) the distribution of wealth, (3) settlement of international dispute mechanisms, (4) the limited authority vested in management institutions, and (5) the rapid rate of change in modern fisheries. Proposed alternatives and recommendations are summarized and evaluated. (Luedtke-Wisconsin)
W77-00179

THE ENVIRONMENT AND THE STRUCTURE OF SOCIAL GOALS,
For primary bibliographic entry see Field 5G.
W77-00181

FISHERIES MANAGEMENT AND SOCIAL CONTEXT: THE CASE OF THE MAINE LOBSTER FISHERY,
National Marine Fisheries Service, Washington, D. C. Fisheries Management Div.
For primary bibliographic entry see Field 6B.
W77-00383

THE INTEGRATION OF ENVIRONMENTAL AND DEVELOPMENT PLANNING FOR ECOLOGICAL CRISIS AREAS IN AFRICA,
Nairobi Univ. (Kenya). Dept. of Geography.
For primary bibliographic entry see Field 6G.
W77-00385

EFFLUENT CHARGES AND POLITICAL REALITIES--A QUALIFICATION,
Pennsylvania State Univ., University Park. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-00392

BASF COMPLETES TEN-YEAR PROJECT FOR CLEANING UP THE RHINE,
For primary bibliographic entry see Field 5D.
W77-00403

IOWA'S EXPERIENCE WITH A MANDATORY SEDIMENT CONTROL LAW,
Iowa Dept. of Soil Conservation, Des Moines.
W. H. Greiner.
Journal of Soil and Water Conservation, Vol. 30, No. 3, May-June 1975. p 132-134.

Descriptors: *Sediment control, *Sediments, *Legislation, *Iowa, Erosion, Erosion control, Soil erosion, Water quality control.
Identifiers: *Sediment control laws.

Before the mid-1960s, sediment control laws w seldom discussed in Iowa, but a chain of eve took place that brought these words i prominence. Iowa was one of the first states enact a sediment control law. Many people refe the law as landmark legislation because no o state has a law that deals with soil erosion to extent this one does. The law surely has had an pact on conservation district programs in Io but it is in no sense a model law. Compromi preceded its enactment. As a result, some secti of the law are not as strong as they could (Skogerboe-Colo St)
W77-00477

6F. Nonstructural Alternatives

FLOOD HAZARD ANALYSIS: CROOK RIVER, TOWN OF CASCO, TOWN OF PLES, CUMBERLAND COUNTY, MAINE,
Soil Conservation Service, Orono, Maine.
For primary bibliographic entry see Field 4A.
W77-00100

FLOOD PLAIN INFORMATION: REPORT RANCOCAS CREEK, BURLINGTON COUN NJ (SUMMARY REPORT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W77-00102

FLOOD PLAIN INFORMATION. SOUTHA TON COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W77-00104

FLOOD PLAIN INFORMATION: RES RECTION RIVER AND SALMON CRE ALASKA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W77-00105

6G. Ecologic Impact Of Water Development

DAMS AND PEOPLE: GEOGRAPHIC IMP AREA ANALYSIS,
Kentucky Water Resources Research Inst., ington.
For primary bibliographic entry see Field 6B.
W77-00008

AN OVERVIEW OF THE IMPACT STUDY THE MCCLELLAN-KERR MULTIPLE P POSE ARKANSAS RIVER SYSTEM,
Institute for Water Resources (Army), Belvoir, Va.
L. G. Antle.
Available from the National Technical Info tion Service, Springfield, Va 22161 as AD/A 975, Price codes: A03 in paper copy, A0 microfiche. IWR Research Report 76-R3. 1975. 35 p, 3 fig, 1 plate, 5 tab, append.

Descriptors: *Watershed management, * systems, *Cost-benefit analysis, *Decision ing, Navigation, Flood protection, Recrea Water supply, Sediment control, Hydroele power, *Multiple-purpose reservoirs, Mul purpose projects, Arkansas, Oklahoma.
Identifiers: *Arkansas River(AR-OK), *Impa sessment, Socioeconomic development, Publ volvement.

Interim conclusions are discussed on the im of the completed McClellan-Kerr Arkansas R Project in Arkansas and Oklahoma. In the ports completed to date, the approach to in

analysis was to begin with physical changes in the river regimen introduced by the project, determine the uses made by people of the changes, trace the changes through higher order impacts, and then weigh these impacts by the values placed on them from a number of perspectives. The 4 completed reports concern: project use, socioeconomic profiles, commodity shipments on the Arkansas River system, and port development. Interim conclusions indicate that impacts were not anticipated and the more significant impacts become obvious only after careful study. During the first year of operation of the system, benefits of users approached costs, but the mix of benefits is quite different than anticipated. Navigation benefits are substantial and probably will exceed forecasts within 10 years. Power benefits are lower, but recreation benefits are significantly higher than predicted. Because of regional differences, benefits and costs are not perceived evenly, and development has occurred differently because of this. In Arkansas, industrial development is proceeding well. Of particular interest is the decision-making process which was followed in developing the implemented plan. There was a persistent conflict between regional and national goals, and the failure to develop considerable waterfront property is seen to have been caused by a lack of follow-through. An appendix focuses on some benefits: navigation, hydroelectric, recreation, sediment control, transportation. (Smith-North Carolina)
W77-00101

ENVIRONMENTAL EFFECTS OF ALTERNATIVE ENERGY DEVELOPMENTS IN THE NORTHERN GREAT PLAINS,
United Nations, New York.
R. A. Luken, and E. H. Pechan.
Computers and Operations Research, Vol 3, No 2/3, p 259-268, August 1976. 3 fig, 7 tab, 19 ref.

Descriptors: *Environmental effects, *Energy, *Model studies, Water, Air, Pollution abatement, Control, Technology, Estimating, Economics, Operations research.
Identifiers: *Northern Great Plains, Residuals.

A model used to characterize environmental conditions in the five-state northern Great Plains region is described. The current conditions and the expected conditions resulting from the development of the region's energy resources are compared with a focus on residuals emitted into the air and water and their relation to other parameters which describe the region. The model relates the levels of current and future economic and demographic activities to the quantities of residuals discharged into the environment. These quantities can be adjusted based on control technology used. Various scenarios of energy resource (primarily coal) development in the region are investigated and comparisons are made between (1) current activity levels and current controls, (2) current activity levels and expected controls, and (3) various future activity levels and future controls. Key residuals studied are particulates, sulfur oxides, biological oxygen demand, and suspended solids. Results of the analysis can be used to evaluate development policies. The various development alternatives can be compared with the present (base) case, and the future case, with no additional energy resource development. (Bell-Cornell)
W77-00115

A COMPUTERIZED SYSTEM FOR WILD LAND USE PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT,
Washington Univ., Seattle. Coll. of Forest Resources.
G. F. Schreuder, K. P. Rustagi, and B. B. Bare.
Computers and Operations Research, Vol. 3, No. 2/3, p 217-228, August 1976. 2 fig, 2 ref.

Descriptors: *Land use, *Assessment, *Simulation analysis, *Environment, *Computer models, Data storage and retrieval, Decision making, Management, Hydrologic aspects, Forest management, Recreation, Fish, Wildlife, Operations research.
Identifiers: *Wild lands, Timber production, *Environmental impact.

A computerized system useful for examining the physical, economic, and environmental consequences of alternative wild land use decisions is described. The system consists of a set of simulation models linked to a geographic data base by an information storage and retrieval subsystem. The simulation models cover forest production, timber harvesting, recreation, fish-wildlife-insect dynamics, and atmospheric and hydrologic processes. System inputs consist of land-use and management decision alternatives. The consequences of these system inputs can be evaluated at varying scales of spatial and temporal resolutions in terms of goods, services, and environmental impacts. Uses to data suggest that the system is a valuable aid to land-use planners and forest management decision makers. (Bell-Cornell)
W77-00119

SOME THOUGHTS ON ZERO DISCHARGE,
Monroe County Drain Commission, Mich.
For primary bibliographic entry see Field 5G.
W77-00125

BALANCING ENVIRONMENTAL QUALITY, ENERGY USE, AND GROWTH: DIFFICULT DECISIONS,
Energy Reserach and Development Administration-Fossil Energy, Washington, D. C.
F. H. Abel.
American Journal of Agricultural Economics, Vol. 57, No. 5, p. 815-818, 1975. 8 ref.

Descriptors: *Energy, *Simulation analysis, *Econometrics, Social aspects, Evaluation, Environment, Welfare(Economics), Cost-benefit analysis, Gross National Product, Decision making, Marginal costs, Marginal benefits, Water pollution effects, Air pollution effects, Model studies.
Identifiers: *Environmental quality, Quality of life, Economic growth, Energy self-sufficiency, Strategic Environmental Assessment System, Chase econometric model, Almond interindustry model.

The relationships between three major issues, environmental quality, economic growth, and energy self-sufficiency are examined. It is concluded that an adequate framework for analyzing the trade-off between these issues does not exist, and a single quality of life function cannot be estimated. The most realistic method of analysis is a trade-off analysis where the level of all major factors are estimated for each policy option, but this leaves the decision maker with the task of comparing noncommensurables. The Strategic Environmental Assessment System (SEAS) developed by EPA is a promising method of predicting this trade-off. Beginning with the Almond Interindustry Model, the system combines fourteen computer models. Economic growth rates, productivity, aggregate demand, and rates of substitution of new cleaner technology for old are inputs, and energy consumption, emissions of forty pollutants, GNP, Unemployment, output, transportation, and investment in plant and equipment are outputs. Some progress is reported in quantifying environmental factors. The best economic measure of changes in environmental quality is suggested to be the estimated damages caused by pollution. Here, imprecise national cost-benefit analysis can be performed, and improved techniques can lead to estimates of marginal costs and benefits needed in trade-off analysis. (Luedtke-Wisconsin)
W77-00175

BEWARE THE WRATH OF OSIRIS,
For primary bibliographic entry see Field 4A.
W77-00177

CONCEPTUAL FRAMEWORK OF ENVIRONMENTAL MANAGEMENT,
Cleveland Dept. of Public Utilities, Ohio. Div. of Utilities Engineering.
A. B. Garlauskas.
Journal of Environmental Management, Vol. 3, No. 3, p. 185-203, 1975. 3 fig., 1 tab., 32 ref.

Descriptors: *Decision making, *Systems analysis, Management, Environment, Environmental control, Methodology, Ecosystems, Comprehensive planning.
Identifiers: *Environmental management.

The conceptual framework of environmental management, defined as a systematic and scientific approach to assuring a congruous interface between natural and man-made systems, is explored. Based on an ecosystems/biological sciences perspective the functional premises of environmental management are (1) to prevent irreversible changes in ecology, (2) to assure man's survival and the progressive improvement in his quality of life, and (3) to direct man's processes as parts of evolving nature as opposed to intrusions upon it. Conflicts which arise from the interaction of artificial and natural systems are resolved through the use of these premises. Functionally this can only be accomplished through multidisciplinary knowledge and interdisciplinary approaches. A simplified two-dimensional linear analysis is used to reveal the stress/anti-stress pattern of adjustment of the man-environmental equilibrium. Management of these stresses requires a systems perspective utilizing systems approach, system analysis, and systems management techniques. These concepts and techniques are used to integrate and balance the components of the environmental management framework: Environment, Disruptions, Effects, (Human) Ecosystem, Engineering and Technology and Legal Controls. The practical application of this methodology at the macro-scale level is beyond present capabilities, but the approach can be sealed down and used at the meso- and micro-scale levels. (Luedtke-Wisconsin)
W77-00178

THE ENVIRONMENT AND THE STRUCTURE OF SOCIAL GOALS,
For primary bibliographic entry see Field 5G.
W77-00181

THE BUDDING ENVIRONMENTAL CLEAN-UP (A VIEWPOINT): PART I. POLLUTION AND ENVIRONMENT,
Bordeaux-1 Univ., Talence (France). Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-00194

EVALUATION OF MULTI-PURPOSE OFFSHORE INDUSTRIAL-PORT ISLANDS. VOL II: MAJOR RESEARCH PROBLEMS AND PROMISING RESEARCH APPROACHES,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 8C.
W77-00199

A REINVESTIGATION OF SOUTHERN CALIFORNIA ROCKY INTERTIDAL BEACHES THREE AND ONE-HALF YEARS AFTER THE 1969 SANTA BARBARA OIL SPILL: A PRELIMINARY REPORT,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W77-00267

TERRESTRIAL OIL SPILLS IN ALASKA: ENVIRONMENTAL EFFECTS AND RECOVERY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5C.

W77-00269

A STUDY OF THE EFFECTS OF THE SAN FRANCISCO OIL SPILL ON MARINE ORGANISMS,
College of Marin, Kentfield, Calif.
For primary bibliographic entry see Field 5C.
W77-00270

INTERAGENCY INVESTIGATIONS OF A PERSISTENT OIL SPILL ON THE WASHINGTON COAST,
National Marine Fisheries Service, Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-00271

COASTAL ZONE BIBLIOGRAPHY: CITATIONS TO DOCUMENTS ON PLANNING, RESOURCES MANAGEMENT AND IMPACT ASSESSMENT, SECOND EDITION,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 2L.
W77-00277

EFFECTS ON COMMERCIAL FISHING OF PETROLEUM DEVELOPMENT OFF THE NORTHEASTERN UNITED STATES,
Woods Hole Oceanographic Institution, Mass. Marine Policy and Ocean Management Program.
For primary bibliographic entry see Field 5C.
W77-00280

ECONOMIC IMPACTS OF STATE ENVIRONMENTAL PROGRAMS IN A NATIONAL FRAMEWORK: THE IOWA CONSERVANCY LAW,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
E. O. Heady, and V. S. S. V. Nagadevara.
Journal of Soil and Water Conservation, Vol. 30, No. 6, p 272-278, November-December, 1975. 3 fig, 5 tab, 8 ref.

Descriptors: *Legislation, *Iowa, *Sediments, *Erosion, Economics, Economic justification, *Economic impact.
Identifiers: Sediment damages.

Several states have passed laws to protect prime farm land, reduce environmental impacts, or eliminate off-site sediment damages. The 1971 Iowa legislature, for example, passed the Conservancy District Act to control the use of soil and water resources and thereby limit annual soil loss. Because of the inelastic demands for farm commodities, one state such as Iowa may restrain land use with the result that its farmers sacrifice income while farmers elsewhere gain income. National models were applied to determine what the outcome would be if Iowa were to fully implement its Conservancy District Act or apply other environmental restraints, such as limiting nitrogen and pesticide use. The results show that in all cases restraints implemented solely in Iowa would reduce net farm income in the state while income elsewhere in the nation would increase. Hence, national as opposed to state legislation is implied for the long run. (Skogerboe-Colo St)
W77-00303

HYGIENIC PROBLEMS OF ENVIRONMENTAL PROTECTION IN CONNECTION WITH THE FURTHER DEVELOPMENT OF SIBERIA AND THE FAR EAST, (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W77-00349

ENVIRONMENTAL IMPACT OF STREAM CHANNELIZATION,
Baker (Michael), Jr., Inc., Beaver, Pa.
W. A. Duvel, Jr., R. D. Volkmar, W. L. Specht, and F. W. Johnson.
Water Resources Bulletin, Vol. 12, No. 4, p 799-812, August 1976. 4 fig, 2 tab, 13 ref. FC-12453, EER-128, ARC-73-185-2562.

Descriptors: *Channels, Streamflow, Channel improvement, Trout, Benthos, Water quality, Hydrology, Freshwater fish, Watersheds(Basins), Flood protection, Environment, *Pennsylvania, *Environmental effects.
Identifiers: *Stream channelization, *Hurricane Agnes, Watershed characteristics, *Environment impact studies.

Geologic, engineering, and biological investigations of six Pennsylvania coldwater streams were undertaken to determine the impact of channel modifications instituted both prior to and following Hurricane Agnes. The primary focus of the study was on the ecological changes brought about by stream channelization. No long-term deleterious effects on water quality, attached algae, benthic fauna, or forage fish populations were found. Trout, however, were found to be greater in number and weight in natural than in channelized stream reaches. Lack of suitable physical habitat appeared to be the primary cause of reduced trout populations in stream reaches which have been channelized. (Lee-ISWS)
W77-00375

THE INTEGRATION OF ENVIRONMENTAL AND DEVELOPMENT PLANNING FOR ECOLOGICAL CRISIS AREAS IN AFRICA,
Nairobi Univ. (Kenya). Dept. of Geography.
S. H. Ominde.
International Social Science Journal, Vol. 27, No. 3, p. 499-516, 1975. 6 tab., 23 ref.

Descriptors: *Planning, *Africa, Resources development, Human population, Urbanization, Rural areas, Industrial production, Regional development, Environmental effects, Social aspects, Management, Foreign countries, Cities, Migration.
Identifiers: *Developing countries, Environmental quality.

The conceptual framework of development planning and environmental conservation, demographic components, urban and rural environmental management problems, and the basic strategies of integrated development planning in Africa are examined. In developing countries, the planner must control environmental problems resulting from poverty, while at the same time adopt measures to prevent economic growth and industrial development from having an unfavorable impact on the society. Falling mortality rates, rising life-expectancy and sustained high birth rates are responsible for the 59% demographic inflation in Africa between 1950 and 1970. Tied to this increase are an accelerating rate of urbanization and the emergence of very large cities. Population growth, however, is only one factor in development problems, not the main cause. Rural development plans must give priority to a regional development concept which promotes a better balance in settlement patterns, a more rational use of resources including the adoption of new technologies, and encourages local participation. Urban development, on the other hand, must be examined with reference to the policy areas of: alternative settlement patterns and city size; strategy for the internal organization of cities; location policies; and strategies for the development of viable growth goals. (Luedtke-Wisconsin).
W77-00385

ENVIRONMENTAL FACTORS IN PRODUCING SUPPLEMENTAL FUELS,
M. R. Beychok.
Hydrocarbon Processing, Vol. 54, No. 10, p. 78-81, 1975. 6 tab, 13 ref. EPA 68-03-2136.

Descriptors: *Environmental effects, *Fuels *Industrial production, Air pollution, Water pollution, Coal, Oil shales, Methane, Natural gas, Efficiencies, Oxides, Energy.
Identifiers: *Alternative energy supplies Synthetic natural gas, Naphtha, Thermal efficiencies.

The degree of air pollution, water utilization, and noise that may be generated by producing supplemental fuels to meet national energy needs are summarized and compared on the basis of tons/unit product Btu output. The industrial processes considered are production of synthetic natural gas from coal, crude oil, and naphtha; production of liquid fuels from oil shale; liquefaction; importing liquid gas (LNG) and as methanol and regasification of LNG. It is estimated that the extraction of 8 to 12 millions tons/yr of coal will require the surface mining of about 250 to 500 acres/yr or a total of 6300 to 15,000 acres over a 25 to 30 year period. On the assumption that a strip mined area can be regraded and revegetated within five years, the maximum amount of land disturbance at any given time would be 1250 to 2500 acres. Underground oil shale mining will entail the disposal of approximately 22.5 million tons/yr of wet spent shale which will pose a leaching hazard, plus the revegetation and reclamation of the shale embankment. It is estimated that a 13% fuel supplement to current oil and gas demand would require mining approximately 1 billion tons/yr of coal and oil shale and might involve almost 400,000 acres of land over a 20 to 25 year span. (Auen-Wisconsin)
W77-00390

THE EFFECT OF HUMANS ON BIOGEOCENOSES AND ENVIRONMENTAL PROTECTION, (IN RUSSIAN),
A. K. Rustamov.
Izv Akad Nauk Turkm SSR Ser Biol Nauk. 6, p 3-9, 1974.

Descriptors: *Ecology, *Environmental effects *Radioactivity effects, *Pesticides, DDT, Industrial wastes, Deserts, Asia, Irrigation practices, Hunting, Mining, Grazing, Construction, Population, *Environmental control.
Identifiers: Biogenesis, *Biogeocenoses, *USSR.

The interaction of the different components in biogeocenosis and the ever-increasing influence of such anthropogenic factors as radioactive fallout, pesticides (particularly DDT), and industrial wastes, are briefly reviewed, followed by discussion of the effect of human activities on the desert biogeocenoses of central Asia (USSR). The effects of hunting, irrigation, mining, livestock grazing, construction projects and other exploitation of desert areas on natural populations (carnivores, large herbivores, birds) are mentioned. Methods of increasing the productivity of desert agrocenoses such as the introduction of a variety of plant and animal species to stabilize cotton monoculture, the use of biological methods of pest control, and the exploitation of wild ungulates as a source of animal protein, are discussed. The importance of environmental protection and the maintenance of optimal interrelations between man and nature is stressed.--Copyright 1976, Biological Abstracts, Inc.
W77-00412

REVIEW OF PCB (POLYCHLORINATED BIPHENYLS) IN THE ENVIRONMENT.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5B.
W77-00463

ENVIRONMENTAL CONSIDERATIONS IN EXPANDING AGRICULTURAL PRODUCTION,
Latin American Program for Resources for the Future, Inc., Washington, D.C.
P. R. Crosson.

Journal of Soil and Water Conservation, Vol. 30, No. 1, p 23-28. January-February 1975.

Descriptors: *Environment, *Environmental effects, Agriculture, *Crop production, Grains, Soybeans, Technology, Ecology, Demand, Foreign trade.

The environmental impacts of increasing agricultural production in the U.S. will depend upon the magnitude of the increase and the kind of technology employed to bring it about. In each case the range of possibilities is so wide that well-grounded statements about likely outcomes are difficult. The great imponderable with respect to production is the growth of foreign demand. This has been the major element in the recent dramatic shifts in prices and production of U.S. agricultural commodities, particularly grains and soybeans. U.S. farmers could easily accommodate prospective increases in domestic demand at reasonable costs, probably with a diminishing land base and a set of conservation and other measures designed to control the environmental impacts of expanded production. When the scenario is broadened to include foreign demand, however, the outlook becomes less clear and the possibility of greatly increased pressures on the environment emerges. (Skogerboe-Colo St)
W77-00470

EPA AND AGRICULTURE: ESTABLISHING A PARTNERSHIP,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-00472

7. RESOURCES DATA

7B. Data Acquisition

FLOAT CALIBRATION IN INTEGRATED-FLOAT TECHNIQUES,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
P. H. John, F. A. Johnson, and P. Sutcliffe.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY8, Proceedings Paper 12308, p 1071-1082, August 1976. 9 fig, 1 tab, 15 ref, 2 append.

Descriptors: *Calibrations, *Measurement, *Floats, *Discharge(Water), Velocity, Rivers, Streams, Hydrology, Hydraulic, Instrumentation, Equations, Mathematical studies, Flow, Discharge measurement.
Identifiers: Terminal velocity.

A method of producing floats of predetermined terminal velocities without the need for individual calibration was developed for use with the integrating-float method of discharge measurement. A calibration curve relating effective density to terminal velocity was used to determine terminal velocities for individual floats, thus eliminating the need for depth or rise time measurements in the application to discharge measurement. (Lee-SWS).
W77-00088

THE DESIGN OF AN INEXPENSIVE RAIN GAGE WITH BOTH AMOUNT AND RATE CAPABILITIES,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2B.
W77-00160

MATHEMATICAL MODEL FOR PREDICTING THE CONSOLIDATION OF DREDGED MATERIAL IN CONFINED DISPOSAL AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 5B.
W77-00167

ASSESSMENT OF PRACTICALITY OF REMOTE SENSING TECHNIQUES FOR A STUDY OF THE EFFECTS OF STRIP MINING IN ALABAMA,
Alabama Univ., University. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5C.
W77-00170

THE USE OF ERTS-1 TO MORE FULLY UTILIZE AND APPLY MARINE STATION DATA TO THE STUDY AND PRODUCTIVITY ALONG THE EASTERN SHELF WATERS OF THE UNITED STATES,
Old Dominion Univ. Research Foundation, Norfolk, Va.
For primary bibliographic entry see Field 5A.
W77-00198

VOLUMETRIC DETERMINATION OF MARINE OIL SPILLS USING COORDINATED AIRBORNE AND SURFACE SAMPLING DATA,
California Univ. Santa Barbara.
For primary bibliographic entry see Field 5A.
W77-00214

VERSATILE MULTIRANGE ANALYTICAL MANIFOLD FOR AUTOMATED ANALYSIS OF NITRATE-NITROGEN,
Agricultural Research Service, Watkinsville, Ga.
For primary bibliographic entry see Field 5A.
W77-00285

BIBLIOGRAPHY ON TIDAL HYDRAULICS, SUPPLEMENTARY MATERIAL COMPILED FROM MAY 1971 TO MAY 1974, ES 816, TIDAL FLOWS IN RIVERS AND HARBORS.
Committee on Tidal Hydraulics (Army), Washington, D.C.
For primary bibliographic entry see Field 2L.
W77-00353

FLEXURAL STRENGTH OF LAKE ICE IN RELATION TO ITS GROWTH STRUCTURE AND THERMAL HISTORY,
Cold Regions Research and Engineering Lab., Hanover, N.H. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W77-00354

EFFECT OF POROSITY ON THE HYDROSTATIC COMPRESSION OF ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W77-00355

SALT FINGERS OBSERVED IN THE MEDITERRANEAN OUTFLOW REGION (34 N, 11 W) USING A TOWED SENSOR,
Massachusetts Inst., of Tech., Cambridge. Dept. of Meteorology.
For primary bibliographic entry see Field 2L.
W77-00363

AN INVESTIGATION OF A COLD EDDY ON THE EASTERN SIDE OF THE GULF STREAM USING NOAA 2 AND NOAA 3 SATELLITE DATA AND SHIP DATA,
Research Triangle Inst., Research Triangle Park, N. C.
For primary bibliographic entry see Field 2L.
W77-00364

GEOMORPHOLOGICAL MAPPING APPLIED TO SOIL EROSION EVALUATION,
National Inst. of Agricultural Engineering, Silsoe (England).
For primary bibliographic entry see Field 2J.
W77-00369

DATA PROCESSING: A REVIEW OF THE ROLE OF THE MINISTRY OF WORKS AND DEVELOPMENT,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 7C.
W77-00378

BIOHYDRODYNAMIC CHANNEL FOR FIELD TRIPS, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
B. V. Kurbatov.
Gidrobiol Zh. 11(2), p 128-130, 1975.

Descriptors: *Analytical techniques, *Aquatic animals, *Equipment, Movement.
Identifiers: *Hydrodynamics, *Kinematics, *Biohydrodynamic channel.

A specialized biohydrodynamic channel was designed and manufactured to study the kinematics and hydrodynamics of aquatic animals under field conditions. It consists of 3 dismountable sections with a total length of 6 m and 0.6 m x 0.5 m in cross section. The middle section has 2 Plexiglas viewing windows measuring 1.5 m x 0.5 m. The tachogenerator, accelerometer, cameras and other equipment are described.—Copyright 1976, Biological Abstracts, Inc.
W77-00417

DEVELOPMENT OF A STANDARD RATING FOR THE PRICE PYGMY CURRENT METER,
Geological Survey, Jackson, Miss.
V. R. Schneider, and G. F. Smoot.
Journal of Research of the U S Geological Survey, Vol 4, No 3, p 293-297, May-June 1976. 1 fig, 7 tab, 1 ref.

Descriptors: *Current meters, *Flow measurement, *Discharge(Water), *Instrumentation, *Standards, Quality control, Performance, Reliability, Data collections, Laboratory tests, Variability, Evaluation, Hydromety.
Identifiers: *Price pygmy meters, *Flow meters(Water).

Fifty new Price pygmy current meters, 50 used Price pygmy meters with used rotors, 50 used Price pygmy meters with new rotors, and 26 used Price pygmy meters with straight uniform (nonbeaded) contract wires were rated individually in a towing tank. A standard rating of $V=0.961N+0.039$ ($V=0.293N+0.012$), where V is the velocity in feet per second (meters per second) and N is the meter rotation in revolutions per second, was established for the group of new meters. Repeated ratings of two new meters showed that under the best rating conditions, the individual Price pygmy rating is repeatable to within 1 percent. The standard errors of velocities predicted using the individual ratings and the standard ratings were compared. The use of the standard rating resulted in statistically higher standard errors than the individual ratings for all groups of meters. However, the differences are a fraction of 1 percent higher and are not of concern for practical purposes. The individual ratings and standard rating for the used meters with new straight contact wires were found to be statistically similar to the ratings for the new meters. Continuation of the use of individual ratings of Price pygmy current meters is probably unnecessary with the implementation of precise standards in their manufac-

ture, rating of a random sample, and use. (Woodard-USGS)
W77-00432

SUITABILITY OF CONTAINERS FOR STORAGE OF WATER SAMPLES,
Australian Mineral Development Labs., Adelaide.
For primary bibliographic entry see Field 5A.
W77-00436

THE EFFECT OF BULK DENSITY ON NEUTRON METER CALIBRATION,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond, (Australia). Div. of Soils.
For primary bibliographic entry see Field 2G.
W77-00440

TOWARDS METHOD STANDARDIZATION: E. COLI COUNTS IN WATER SAMPLES USING MEMBRANE FILTERS, (IN TURKISH),
Hacettepe Universitasi, Ankara (Turkey). Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W77-00453

IDENTIFICATION AND ANALYSIS OF ORGANIC POLLUTANTS IN WATER.
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-00455

THE MINERAL CONTENT IN SOIL AND SUBSOIL WATER CLOSE TO THE SURFACE BELOW CONIFEROUS AND ARABLE LAND IN SANDY SOIL OF NORTHWEST GERMANY, (IN GERMAN),
Landwirtschaftskammer Weser-Ems, Oldenburg (West Germany).
For primary bibliographic entry see Field 2G.
W77-00493

SPECIES DIVERSITY OF FRESHWATER PLANKTON AGGLOMERATIONS, (IN POLISH),
K. Starzykowa.
Przegl Zool. 18(1), p 54-57, 1974.

Descriptors: *Zooplankton, *Environmental effects, Ecology, Ecological distribution, Methodology.
Identifiers: *Species diversity.

Methods of determining the species diversity of zooplankton are presented. The problem of the dependence of species diversity on the environment, especially food and the age of the water basin are discussed. The necessity of detailed studies of the biology and population ecology of each species is stressed.–Copyright 1975, Biological Abstracts, Inc.
W77-00495

ON THE INFLUENCE OF WATER CURRENTS ON THE GROWTH OF HYDRORHIZAL COLONIES, (IN GERMAN),
Ruhr-Universitaet Bochum (West Germany). Institut fuer Spezials Zoologie.
For primary bibliographic entry see Field 2I.
W77-00506

METHOD OF SIMULTANEOUS DETERMINATION OF WATER CONDUCTIVITY OF SOILS AND PLANTS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 2I.
W77-00512

7C. Evaluation, Processing and Publication

COMPUTER EVALUATION OF SLUDGE HANDLING AND DISPOSAL COSTS,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W77-00012

FLOOD PLAIN INFORMATION: SOUTHAMPTON COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W77-00104

FLOOD PLAIN INFORMATION: RESURRECTION RIVER AND SALMON CREEK, ALASKA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W77-00105

BIOLOGICAL ASSESSMENT OF WATER QUALITY IN THREE BRITISH RIVERS: THE NORTH ESK (SCOTLAND), THE IVEL (ENGLAND) AND THE TAF (WALES),
Aston Univ., Birmingham (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W77-00108

OR DATA BASE INTERFACE--AN APPLICATION TO POLLUTION CONTROL,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W77-00116

ECONOMIC OPTIMUM RECORD LENGTH,
Nielsen and Rauschenberger A/S, Lyngby (Denmark).
For primary bibliographic entry see Field 4A.
W77-00117

USER'S GUIDE FOR HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 10B.
W77-00161

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 3, HYDROLOGIC FREQUENCY ANALYSIS,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W77-00169

STATE OF SOUTH CAROLINA WEATHER AND CROP SUMMARIES,
South Carolina Water Resources Commission, Columbia.
For primary bibliographic entry see Field 3F.
W77-00282

PROJECT FOG DROPS V - TASK I: A NUMERICAL MODEL OF ADVECTION FOG, TASK II: RECOMMENDATIONS FOR SIMPLIFIED INDIVIDUAL ZERO-GRAVITY CLOUD PHYSICS EXPERIMENTS,
Calspan Corp., Buffalo, N. Y.
For primary bibliographic entry see Field 2B.
W77-00357

APPENDIX 4, LIMNOLOGY OF LAKES AND EMBAYMENTS, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Mich. Public Information Office.
For primary bibliographic entry see Field 2H.
W77-00358

MAPPING RUNOFF-PRODUCING ZONES IN HUMID REGIONS,
McGill Univ., Montreal (Quebec). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W77-00368

GEOMORPHOLOGICAL MAPPING APPLIED TO SOIL EROSION EVALUATION,
National Inst. of Agricultural Engineering, Silsoe (England).
For primary bibliographic entry see Field 2J.
W77-00369

TOWARDS A COMPUTER-BASED INFORMATION-RETRIEVAL SYSTEM FOR GROUNDWATER DATA,
New Zealand Geological Survey, Christchurch.
R. B. McCammon.
Journal of Hydrology (New Zealand), Vol. 14, No. 1, p 9-19, 1975. 3 fig, 1 tab, 2 ref, 1 append.

Descriptors: *Information retrieval, *Data storage and retrieval, *Groundwater, *Well data, *Data collections, Basic data collections, Hydrologic data, Wells, Water wells, Computers, Computer programs, Automation.
Identifiers: *New Zealand.

In the near future, most regional water boards in New Zealand will have on-going investigations into underground water. Because underground water represents a hidden resource, indirect methods, namely well drilling, must be used in an attempt to better understand underground water supplies. The information obtained from boreholes therefore is of paramount importance. With the greater number of wells being drilled at present together with the well records already on file computer-based systems for information retrieval offer definite promise for the future. A key factor in the design of such a system is the nature of the man-computer dialogue. Question-and-answer, menu-selection and natural-English type dialogues are particularly well suited for the retrieval of water-well records from data files. Whichever system is put forward, it is important that potential users of the system be involved in all stages of development. (Sims-ISWS)
W77-00377

DATA PROCESSING: A REVIEW OF THE ROLE OF THE MINISTRY OF WORKS AND DEVELOPMENT,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
R. P. Ibbitt.
Journal of Hydrology (New Zealand), Vol. 14, No. 1, p 21-29, 1975. 3 ref.

Descriptors: *Data storage and retrieval, *Information retrieval, *Data processing, *Data collections, Hydrologic data, Surface water, Precipitation(Atmospheric), Rainfall, Water levels, Groundwater, Instrumentation, Equipment, Computers, Computer programs, Automation.
Identifiers: *New Zealand.

When instrumentation is chosen for collecting data, decisions are made, often implicitly, about the purposes for which the data are to be collected and about the accuracy needed to fulfill these purposes. Frequently, unforeseen circumstances affect the type of instrument required or the objective(s) for which the data are being collected

ome of the consequences of the use of inappropriate instruments were examined. A description was then given of the different types of data urrently being processed by the Ministry of Works and Development and of how the type of lata affects the processing. The relative merits of ifferent forms of publication based on the data ere discussed, and the conclusions led to a escription of the ways in which users can obtain he data. (Sims-ISWS)
W77-00378

ECISION-MAKING IN RECREATIONAL ISHERIES MANAGEMENT: AN ANALYSIS,
irginia Polytechnic Inst. and State Univ., lacksburg. Dept. of Fisheries and Wildlife ciences.
or primary bibliographic entry see Field 6B.
W77-00391

YDROLOGIC UNIT MAP--1974, STATE OF OWA
eological Survey, Reston, Va.
ydrologic Unit Map of Iowa, 1976. 1 sheet.

escriptors: *Maps, *Hydrology, *Iowa, Water esources, Data collections, Planning, Hydrologic ystems, Regions, Land resources.
dentifiers: *Hydrologic unit maps(Iowa), Hydrologic boundaries, Subregions, Accounting nits, Cataloging units.

his map and accompanying table show Hydrologc Units in Iowa that are basically hydrographic in ature. The Cataloging Units shown will supplant he Cataloging Units previously used by the U.S. eological Survey in its Catalog of Information on ater Data (1966-72). The Regions, Subregions nd Accounting Units are aggregates of the ataloging Units. The Regions and Subregions are urrently (1974) used by the U.S. Water Resources ouncil for comprehensive planning, including the ational Assessment, and as a standard geoaphical framework for more detailed water and elated land-resources planning. The Accounting nits are those currently (1974) in use by the U.S. eological Survey for managing the National ater Data Network. (Woodard-USGS)
W77-00425

YDROGEOLOGIC DATA FROM THE GREAT END PRAIRIE, SOUTH-CENTRAL KANSAS,
eological Survey, Lawrence, Kans.
or primary bibliographic entry see Field 4B.
W77-00426

EAN ANNUAL RUNOFF IN THE UPPER HIO RIVER BASIN, 1941-70, AND ITS ISTORIC VARIATION,
eological Survey, Harrisburg, Pa.
or primary bibliographic entry see Field 2E.
W77-00428

YDROLOGIC UNIT MAP--1974, STATE OF YOMING.
eological Survey, Reston, Va.
or sale by USGS, Reston, Va., 22092, price 1.25. Hydrologic Unit Map of Wyoming, 1976. 1 eet, 1 map.

escriptors: *Maps, *Hydrology, *Wyoming, ater resources, Data collections, Planning, ydrologic systems, Regions, Land resources.
entifiers: *Hydrologic unit maps(Wyo), Hydrologic boundaries, Subregions, Accounting nits, Cataloging units.

his map and accompanying table show Hydrolog- Units in Wyoming that are basically hydroaphic in nature. The Cataloging Units shown will pplant the Cataloging Units previously used by e U.S. Geological Survey in its Catalog of Infor- ation on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-00429

GROUND-WATER LEVELS IN THE UNITED STATES, 1970-74: SOUTH-CENTRAL STATES.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W77-00430

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 4. ST. LAWRENCE RIVER BASIN--VOLUME 2. ST. LAWRENCE RIVER BASIN BELOW LAKE HURON.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W77-00431

DEVELOPMENT OF A STANDARD RATING FOR THE PRICE PYGMY CURRENT METER,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7B.
W77-00432

FLOODS OF MARCH-APRIL 1973 IN SOUTHEASTERN UNITED STATES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W77-00434

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1975.
Geological Survey, Tuscaloosa, Ala.
Water-Data Report AL-75-1, 1975. 377 p, 7 fig, 3 tab, 46 ref.

Descriptors: *Alabama, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Flow rates, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling sites, Water levels, Water analysis, Basic data collections.

Water resources data for the 1975 water year for Alabama consists of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 97 gaging stations; stage and contents for 12 lakes and reservoirs; water quality for 44 stations and water levels for 47 observation wells. Also included are data from crest-stage partial-record stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Alabama. (Woodard-USGS)
W77-00435

A WATER BALANCE MODEL AND SUPPLY INDEX FOR WHEAT IN SOUTH AUSTRALIA,
Commonwealth Scientific and Industrial Research Ogrganization, Adelaide (Australia). Div. of Soils.
For primary bibliographic entry see Field 3F.
W77-00444

STOICHIOMETRIC DISTANCE AND TOTAL CONCENTRATION: A BINARY NUMERICAL DESCRIPTION OF INLAND WATER CEHMISTRY,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2K.
W77-00449

DIGITAL SIMULATION OF A BASALT AQUIFER SYSTEM, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4B.
W77-00481

GROUND-WATER DATA FOR ATTALA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
B. E. Wasson.
Mississippi Board of Water Commissioners, (Jackson), County Report No 4, 1976. 26 p, 3 fig, 3 tab, 7 ref.

Descriptors: *Groundwater resources, *Well data, *Aquifers, *Water quality, *Mississippi, Water levels, Water users, Drillers logs, Chemical analysis, *Water wells, Data collections.
Identifiers: *Attala County(Miss), Sand intervals, Electric logs.

This is one in a series of ground-water basic-data reports being prepared for the 82 counties of Mississippi to meet the need for information about the availability and quality of water in the State. The data for Attala County are presented in three tables: (1) well descriptions, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells for which data are presented. (Woodard-USGS)
W77-00484

MAXIMUM KNOWN STAGES AND DISCHARGES OF NEW YORK STREAMS THROUGH 1973,
Geological Survey, Albany, N.Y.
I. R. Leonard, and B. Dunn.
New York State Department of Environmental Conservation, Albany, Bulletin 72, 1976. 67 p.

Descriptors: *Peak discharge, *Flood stages, *Streams, *New York, Hydrologic data, Gaging stations, Data collections, Discharge frequency.
Identifiers: Maximum discharge stages, Period-of-record maximum discharges.

This report is a compilation of all known maximum stages and discharges of New York streams in the files of the U.S. Geological Survey, including some data furnished by other Federal, State, and private organizations. The compilation is an updating of New York State Water Resources Commission Bulletin 67 published in 1970 and includes data through 1973. Maximum stages and rates of discharge have been determined at regular gaging stations, partial-record stations, and at other locations where data became available after floods since about 1900 under cooperative agreement between the State of New York and the U.S. Geological Survey. (Woodard-USGS)
W77-00485

SEDIMENT DISCHARGE IN THE UPPER ARROYO GRANDE AND SANTA RITA CREEK BASINS, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W77-00487

8. ENGINEERING WORKS

8B. Hydraulics

FLOW APPROACHING FILTER WASHWATER TROUGHS,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W77-00053

SOURCE AND TRIBUTARY-SOURCE LINK LENGTHS IN NATURAL CHANNEL NETWORKS,
New South Wales Univ., Kensington (Australia). School of Geography.
A. D. Abrahams, and R. N. Campbell.
Geological Society of America Bulletin, Vol. 87, No. 7, p 1016-1020, July 1976. 5 fig, 2 tab, 11 ref.

Descriptors: *Australia, *Channel morphology, *Drainage patterns(Geologic), *Drainage, Drainage systems, Basins, Geomorphology, On-site investigations, Statistics, Tributaries, Networks.
Identifiers: *Basin morphometry, *Channel networks, Link-length properties, Tributary source, Natural channel networks.

Exterior links may be classified according to the type of link they join at their downstream end. Those which join another exterior link are termed 'source links,' and those which join an interior link are termed 'tributary-source links.' The length distributions of source and tributary-source links were compared for two areas in eastern Australia where channel networks have developed in dissimilar materials under disparate climatic conditions and have reached quite different stages of evolution. Statistical tests confirmed that these two types of links have different length distributions in both areas. In particular, there tended to be relatively more short, and therefore relatively fewer long, source links than tributary-source links. Analyses of length data for both types of links from other areas gave similar results. It was concluded that there are inherent differences between the lengths of source and tributary-source links in natural channel networks. These differences were attributed to a tendency for the lengths of tributary-source links to increase downstream as the lengths of the main valley sides on which they have developed increase. (Lee-ISWS)
W77-00084

GULLY DEVELOPMENT AND CONTROL: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2J.
W77-00097

OPTIMAL DESIGN OF SINGLE RESERVOIR SYSTEM USING (DELTA) RELASE POLICY,
California Polytechnic State Univ., San Luis Obispo. Dept. of Computer Science and Statistics.
For primary bibliographic entry see Field 4A.
W77-00109

ROLE OF EDDY DIFFUSIVITY IN THERMOCLINE FORMATION,
Leicester Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 2H.
W77-00139

ANALYTICAL SOLUTION FOR 3-D DIFFUSION MODEL,
Envirosphere/EBASCO, New York.
For primary bibliographic entry see Field 5B.
W77-00141

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 3, HYDROLOGIC FREQUENCY ANALYSIS,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W77-00169

ENERGY GRADIENT LINE FOR DRIP IRRIGATION LATERALS,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-00318

ADJUSTMENT OF STREAM-CHANNEL SHAPE TO HYDROLOGIC REGIME,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
G. Pickup.
Journal of Hydrology, Vol. 30, No. 4, p 365-373, August 1976. 1 fig, 1 tab, 14 ref.

Descriptors: *Sediment transport, *Channels, *Geomorphology, *Bed load, Streams, Sediment load, Mathematical studies, Streamflow, Hydraulics, Discharge(Water), Equations.
Identifiers: *Hydrologic regime, Channel geometry, Channel width, Dominant discharge.

Bed load channels tend to adjust their cross-sections so that, given slope, roughness, and sediment load, channel shape approaches the optimum for bed load transport. The extent to which any one shape is the optimum varies with discharge, so four Cumberland Basin stream channels were investigated to determine the discharges at which their present cross-sections represent the optimum for bed load transport. These discharges had return periods ranging from 1.1 to 1.5 years on the annual series. The return periods closely corresponded with return periods for the discharge at which, over a period of time, the most bed load is transported. These return periods varied from 1.15 to 1.45 years when the same bed load equation was used. The close correspondence between sets of return periods suggested that bed load channels tend to adjust their cross-sections to become the optimum shape for bed load transport at or close to the discharge at which the most bed load transport is accomplished. (Lee-ISWS)
W77-00379

SIMILITUDE IN COASTAL ENGINEERING,
Tetra Tech. Inc., Pasadena, Calif.
B. LeMehaute.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW3, Proceedings Paper 12293, p 317-335, August 1976. 2 fig, 13 ref.

Descriptors: *Model studies, *Sediment transport, Waves(Water), Coastal engineering, Hydraulic models, Hydraulics, Equations, Froude number, Reynolds number, Head loss, Structures, Beds.
Identifiers: *Similitude, *Scale effect, Scale models, Wave energy, Froude similitude, Reynolds similitude, Movable bed models.

The basic principles of the engineering approach to similitude were given with emphasis on coastal engineering applications. In contrast to the parallel that exists between the Froude similitude and the Reynolds similitude as it is often formerly presented, the parallel between the similitude of 'short' model and similitude of 'long' model was stressed as the most practical engineering approach to scale model technology. Scale effects were determined quantitatively as the results of viscous damping and capillary effects. Density effects were examined, and the problem of similitude of wave forces—or more generally of time-dependent phenomenons-were quantitatively determined. Some digressions on movable bed scale models were also presented. (Lee-ISWS)
W77-00380

EFFECTS OF NEAR-WELL PERMEABILITY VARIATION ON WELL PERFORMANCE,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 4B.
W77-00437

DRILLING MUD INVASION OF UNCONSOLIDATED AQUIFER MATERIALS,
New South Wales Univ., Kensington (Australia). Water Research Lab.
C. R. Dudgeon, and R. J. Cox.
Australian Water Resources Council, Canberra. Technical Paper No. 17, 1976. 216 p, 15 fig, 2 tab, 23 ref, append.

Descriptors: *Drilling fluids, *Unconsolidated aquifers, *Water wells, *Water yield, Drilling, Boreholes, Aquifer characteristics.

All drilling methods impair the ability of an aquifer to deliver water to the drilled hole; where drilling mud is used, and aquifer pores are large enough, the excess hydrostatic head relied upon to maintain the open hole will force the mud and cutting into the surrounding aquifer. Details of a series of tests with commonly used drilling muds, to examine development of filter cakes, the depth of mud invasion, and the degree of permanent formation damage under various flow conditions, are presented. Guidelines are provided for the choice and use of drilling fluid materials. (CSIRO)
W77-00438

8C. Hydraulic Machinery

TUNNELLING MACHINE USED FOR DRAI TUNNEL FOR ROUNDHILL SEWAGE TREAT MENT WORKS BREAKS RECORD.
Water Services, Vol 80, No 963, p 312, 316, May 1976.

Descriptors: *Tunnel construction, *Tunnel design, *Tunneling machines, *Tunnelin *Drainage systems, Sewage treatment, Treatme facilities, Equipment, Construction, Hydrau structures, Drains.

The construction of a 500-meter drain tunnel for sewage treatment works is discussed, with particular emphasis on the tunnelling machine used which did the job in record time. The material being tunnelled consisted of Bunter pebble beds and Bunt sandstone. The tunnel shape chosen was one w a straight base and an arched roof. The machi chosen to drive the tunnel was an Atlas Cop Mini Full Facer which has also proven itself such materials as dolomitic limestone, abrasi limestone, and metamorphus limestone. Up to 3 meters of tunnelling was accomplished in one d (20 digging hours) with the machine as compar to the previous record of 22 meters. The init entry of the machine was aided by the constru tion of concrete walls at the starting end in orc that the gripper pads would have solid material push against. The machine is designed to work i depth of 1 foot of water. (Kreager-FIRL)
W77-00069

PLANNING AND CONSTRUCTION OF BI MINGHAM'S MAIN OUTFALL SEWER,
Metropolitan Borough of Wolverhampt (England). Dept. of Technical Services.
For primary bibliographic entry see Field 5D.
W77-00072

SEWER FORCE MAIN HELPS SOLVE POLL TION PROBLEM.
For primary bibliographic entry see Field 5D.
W77-00075

KAMINISTIQUIA INTERCEPTOR SEW COMPLETED IN THUNDER BAY.
For primary bibliographic entry see Field 5D.
W77-00076

EVALUATION OF MULTI-PURPO OFFSHORE INDUSTRIAL-PORT ISLAN

VOL II: MAJOR RESEARCH PROBLEMS AND PROMISING RESEARCH APPROACHES,
Delaware Univ., Newark. Coll. of Marine Studies.
W. S. Gaither.
Available from the National Technical Information Service, Springfield VA 22161 as PB-248 335, Price codes: A21 in paper copy, A01 in microfiche. Delaware University College of Marine Studies Final Workshop Report to NSF-RANN No. NSF-RA-E-75-054B, May 1975. 95 p, 9 append. NSF-GI-43111.

Descriptors: *Islands, *Economics, *Environmental effects, *Structure, *Construction, Legal aspects.
Identifiers: *Artificial islands(Ports), U.S. East Coast, Gulf Coast, Deepwater ports, Islands(Artificial), Islands(Man-made), Offshore industrial islands.

This study was designed to evaluate the economic engineering, legal, and environmental possibility of large (four to six square mile) artificial industrial/port islands located off the U.S. Atlantic and Gulf Coasts, and is reported in two volumes. This volume describes the procedures and results from the workshop which was conducted to identify major problems and promising approaches to solve the problems associated with man-made islands. The workshop was divided into the following functional groups: (1) Economics and Finance; (2) Industrial Tenants; (3) Environmental; (4) Legal and Institutional; and (5) Structure and Construction. (Sinha-OEIS)
W77-00199

8D. Soil Mechanics

SOIL BULK DENSITIES AFTER THIRTY YEARS UNDER DIFFERENT MANAGEMENT REGIMES,
Grand Valley State Coll., Allendale, Mich. Dept. of Environmemtal Science.
For primary bibliographic entry see Field 2G.
W77-00287

8E. Rock Mechanics and Geology

ADJUSTMENT OF STREAM-CHANNEL SHAPE TO HYDROLOGIC REGIME,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 8B.
W77-00379

8F. Concrete

A RETROSPECTIVE ON THE STRUCTURAL STABILITY OF RCC SPUN SEWER PIPES,
National Water Authority of Jamaica (Kingston).
For primary bibliographic entry see Field 5D.
W77-00073

8G. Materials

LARGE-DIAMETER CORRUGATED STEEL PIPE ENTERS STORM SEWER FIELD.
For primary bibliographic entry see Field 5D.
W77-00074

8I. Fisheries Engineering

EFFECT OF IRRIGATION PUMPING ON DESERT PUPFISH HABITATS IN ASH MEADOWS, NYE COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
V. W. Dudley, Jr., and J. D. Larson.
Available from USGS, 604 S. Pickett St. Alexandria, Va. 22304, price $1.45. Professional Paper 927, 1976. 52 p, 24 fig, 8 tab, 29 ref.

Descriptors: *Ecology, *Fish, *Irrigation, *Pumping, *Groundwater, Environmental effects, Arid lands, Lakes, Collapse, *Nevada, Irrigation water, Springs.
Identifiers: *Desert pupfish, *Rare fish species, *Cyprinodon, Devils Hole(Nev).

The Ash Meadows area, at the southern tip of the Amargosa Desert in southern Nevada, discharges ground water collected over several thousand square miles of a regional flow system developed in Paleozoic carbonate rocks. Water moves westward across fault contacts from the bedrock into poorly interconnected gravel, sand, and terrestrial-limestone aquifers in the upper few hundred feet of the basin sediments at Ash Meadows. A small pool in Devils Hole, which is a collapse depression in Cambrian limestone, and numerous springs in the adjacent desert valley contain rare fish species of the genus Cyprinodon, faunal remnants of Pleistocene lakes. The Devils Hole pupfish, C. diabolis, is the most endangered of the several surviving species that have evolved since the post-pluvial isolation of their ancestors. This population feeds and reproduces on a slightly submerged rock ledge. Recent irrigation pumping has nearly exposed this ledge. Correlation of pumping histories with the stage in Devils Hole allows identification of several wells that affect the pool level most severly. Some springs that are habitats for other species of Cyprinodon have reduced discharge because of pumping. Hydraulic testing, long-term water-level monitoring, water quality, and geologic evidence aid in defining the principal flow paths and hydraulic interconnections in the Ash Meadows area. (Woodard-USGS)
W77-00427

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

GRADUATE EDUCATION OPPORTUNITIES IN WATER RESOURCES IN THE STATE OF MINNESOTA.
Minnesota Univ., Minneapolis. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 881, Price codes: A03 in paper copy, A01 in microfiche. Bulletin 89, July 1976, 50 p. OWRT A-999-MINN (41), 14-34-0001-6024.

Descriptors: *Minnesota, *Education, *Colleges, *Universities, Training, Scientific personnel, Engineering education.
Identifiers: *Graduate education.

Information is presented pertaining to graduate programs and courses related to water resources, and on faculty members having interests in water resources in colleges and universities in Minnesota. (Waelti-Minnesota)
W77-00156

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

USER'S GUIDE FOR HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
T. W. Johnson, J. Wysor, and R. Marchany.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 873, Price codes: A04 in paper copy, A01 in microfiche. Research Report, July 1975. 75 p, 16 fig. OWRT A-045-NC(1).

Descriptors: *Computer programs, *Programs, *Data collections, *Information retrieval, Computers, Data processing, Data storage and retrieval, Streamflow, Temperature, Rainfall.

The Hydrologic Information Storage and Retrieval System (HISARS) was developed at the University of North Carolina. It is a computerized system in which masses of streamflow, temperature, rainfall, and allied data are stored. The data can be accessed and processed in many ways. This guide is intended to serve as a self-contained reference for use of the system access facilities. (Froehlich-ISWS)
W77-00161

10C. Secondary Publication And Distribution

USER'S GUIDE FOR HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 10B.
W77-00161

COASTAL ZONE BIBLIOGRAPHY: CITATIONS TO DOCUMENTS ON PLANNING, RESOURCES MANAGEMENT AND IMPACT ASSESSMENT, SECOND EDITION,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 2L.
W77-00277

ANNOTATED BIBLIOGRAPHY ON TRICKLE IRRIGATION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-00315

BIBLIOGRAPHY ON TIDAL HYDRAULICS, SUPPLEMENTARY MATERIAL COMPILED FROM MAY 1971 TO MAY 1974, ES 816, TIDAL FLOWS IN RIVERS AND HARBORS.
Committee on Tidal Hydraulics (Army), Washington, D.C.
For primary bibliographic entry see Field 2L.
W77-00353

10D. Specialized Information Center Services

EFFECTIVENESS OF INFORMATION TRANSFER THROUGH WATER RESOURCES RESEARCHER/USER GROUP INTERACTION,
Massachusetts Univ., Amherst. Water Resources Research Center.
R. Kreplick, and J. C. Sawyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 767, Price codes: A09 in paper copy, A01 in microfiche. WRRC Pub. No. 73, Completion Report FY-76-17, June 1976. 144 p, 1 fig, 11 tab, 79 ref, 8 append. OWRT A-076-MASS(1). 14-31-0001-5021.

Descriptors: *Information exchange, Technology, Information retrieval, Communication, *Attitudes.
Identifiers: *Information transfer, *Technology transfer.

The interpersonal user group approach was utilized to communicate relevancy of water resources research to local, state, and federal agency personnel. Approximately 100 professionals participated in stages of the project, from experience interviews to interaction in 18 informal meetings. Discussion is presented in the context of pertinent studies, communication patterns and systems, perceptions of institutional arrangements, current utilization and fields related to research utilization. The effectiveness of interpersonal communication was measured by a questionnaire on the awareness and attitude dimensions. Auxiliary measures included an in-meeting observational technique, and content analysis of taped meetings categorized according to questionnaire dimensions. The awareness items concentrated on knowledge, prior contact, and sources utilized; the attitude scale included applicability of research, the need for user/researcher contact, and research availability. Results showed some significant positive change in awareness responses. Reaction to the Likert scale showed an intuitively neutral to slightly positive result on pre- and post-test for both users and researchers although individual items showed significant positive change. Researchers and users were positive about the need for contact and user input in formulating research questions; however, political and economic considerations and user/researcher perceptions of each group's practical problems showed neutral to negative reactions. Content analysis supported questionnaire results. The findings showed both the potentials and the barriers to interpersonal interaction. However, the user group mechanism is recommended for continued feedback for the utilization of water resources research.
W77-00151

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Franklin Institute (FIPL), Municipal and Industrial Wastewater Treatment Technology	W77-00009--00056 00058--00061 00063--00082	72
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- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 2
JANUARY 15, 1977

W77-00526 -- W77-01050

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 20 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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ST OF PAPERS, 1967/1975, NTERNATIONAL ASSOCIATION FOR YDRAULIC RESEARCH).
ternational Association for Hydraulic Research, lft (Netherlands).
r primary bibliographic entry see Field 10C.
77-00636

STABLE ESTIMATOR FOR LINEAR ODELS: 2. REAL WORLD HYDROLOGIC AP-ICATIONS,
via Univ. (Italy).
r primary bibliographic entry see Field 2E.
77-00640

ASONAL SNOW ACCUMULATION, MELT ND WATER INPUT--A NEW ENGLAND ODEL,
gricultural Research Service, University Park, . Northeast Watershed Research Center.
L. Hendrick, and R. J. DeAngelis.
urnal of Applied Meteorology, Vol. 15, No. 7, p 7-727, July 1976. 15 fig, 2 tab, 5 ref.

escriptors: *Snowpacks, *Snowmelt, *Model udies, *Vermont, *New England, Precipita-on(Atmospheric), Snowfall, Seasonal, Rainfall, inter, Spring, Temperature, Elevation, Equa-ons, Climatology, Estimating equations, Mathe-atical models, Watersheds(Basins), Runoff, On-e observations, Surveys, Snow surveys, Water sources, Meteorological data, Meteorology.

wo geographic parameters, elevation and titude, account for much of the spatial variation temperature and precipitation over New En-and during the winter and spring seasons. Since mperature controls the amount of precipitation hich falls as snow and is highly related to snow-elt, a spatial seasonal climatology of snow accu-ulation, melt and water input can be derived by odeling the elevation and latitude effects on tem-rature and precipitation distributions. Such a odel was developed primarily from Agricultural esearch Service Sleepers River Watershed data northern Vermont. Based only on predictor sta-on temperature and precipitation observations d on elevation and latitude differences between edictor and predictand locations, snowpack ac-mulation, melt, and water input were estimated r 10-day time steps through the snow accumula-on and melt season (2 November through 30 ay). Using a low-elevation station to estimate owpack at higher elevations, model estimations snowpack water equivalent represented a 46% provement over climatological averages. Com-rable skill was obtained in specifying water put. Skill diminished with increasing predictor-edictand distance to near zero at about 100 mi 61 km). This model enabled much of the climatic d 10-day synoptic information on snowpack ac-mulation, melt, and water input over unob-rved watersheds to be estimated from ordinary ational Weather Service network temperature d precipitation observations. (Sims-ISWS)
77-00646

CE-BEARING CUMULUS CLOUD EVOLU-ION: NUMERICAL SIMULATION AND ENERAL COMPARISON AGAINST OBSER-ATIONS,
and Corp., Santa Monica, Calif.
or primary bibliographic entry see Field 2B.
77-00648

ESEARCH FOR THE DEVELOPMENT OF UIDELINES FOR CONDUCTING AND

ANALYZING AN ENVIRONMENTAL WATER QUALITY STUDY TO DETERMINE STATISTI-CALLY MEANINGFUL RESULTS,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 7B.
W77-00677

RESERVOIR SEDIMENTATION ASSOCIATED WITH CATCHMENT ATTRIBUTES, LAND-SLIDE POTENTIAL, GEOLOGIC FAULT, AND SOIL CHARACTERISTICS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2J.
W77-00779

SIMULATING EROSION DYNAMICS WITH A DETERMINISTIC DISTRIBUTED WATERSHED MODEL,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 4D.
W77-00788

DIGITAL SIMULATION OF AGGRADATION AND DEGRADATION IN NATURAL STREAMS,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 2J.
W77-00818

PATTERNS OF SCOUR AND FILL IN POOL-RAPID RIVERS,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2J.
W77-00837

COMPARISON OF SYSTEMS AND PHYSICAL HYDROLOGY APPROACHES TO HYDROLOG-IC MODELLING,
Wollongong Univ. Coll. (Australia).
M. J. Boyd.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 35 - 39, June 1976. 5fig., 2 tab, 14 ref.

Descriptors: *Mathematical models, *Rainfall-runoff relationships, *Watersheds(Basins), Water storage, Systems analysis, Optimization, Storm runoff.

In mathematical modelling of the storm rainfall-runoff process, a systems approach treats the catchment as a single unit, and utilises parameters of limited physical significance. A physical hydrology approach considers the internal properties of the catchment, and interpretation of its parameters in terms of these properties is possible. A physically-based model is presented in terms of elements identified with the watershed bounded sub-areas of the catchment. This form of structure allows storage to be allocated accurately to the model elements using measured storage properties of the corresponding sub-areas. Parameters are evaluated from the catchment properties, leaving a minimum of optimisation for final fitting. The model is developed using data from ten catchments. The response characteristics of the model are shown to be superior to those of two models based on a systems approach. (CSIRO)
W77-00939

A REGIONAL STORMWATER DRAINAGE MODEL,
For primary bibliographic entry see Field 4A.
W77-00940

STATISTICAL SENSITIVITY OF PARAME-TERS IN A RAINFALL-RUNOFF MODEL,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. G. Mein, and B. M. Brown.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 83 - 87, June 1976. 1 fig., 2 tab, 11 ref.

Descriptors: *Mathematical models, *Rainfall-runoff relationships, *Statistical methods, Streamflow forecasting, Watershed management, Land use, Watersheds(Basins), *Australia.
Identifiers: Thomson River(Vic).

A statistical analysis is presented whereby the statistical sensitivity of each parameter of a mathematical rainfall-runoff model can be estimated. Such an analysis is useful in assessing the potential of a mathematical model in predicting the effect of land-use change on catchment response, and the possibility of relating a models parameters to physical catchment characteristics and its consequent applicability to ungauged catchments. To illustrate the procedure, the Boughton model (with baseflow routines added) was applied to the Thomson River (Victoria, Australia). The results show that even when the model is good in predicting monthly streamflows, most of the individual parameters have a high variance, i.e. are imprecise. Indications are that, for this model at least, it would be difficult to show a statistically significant change in any single parameter due to any land use change. (CSIRO)
W77-00948

DEVELOPMENT OF A CONTINUOUS URBAN RAINFALL-RUNOFF MODEL,
Monash Univ., Clayton (Australia).
R. M. Wootton, and R. G. Mein.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 88 - 92, June 1976. 5 fig., 1 tab, 12 ref.

Descriptors: *Urban runoff, *Mathematical models, *Rainfall-runoff relationships, *Antecedent moisture content, Soil water movement, Infiltration, Urban hydrology, *Australia.
Identifiers: Yarralumla Creek(A.C.T.).

In order to overcome the limitations of discontinuous models of the rainfall-runoff process caused by the assumption of average antecedent conditions, a continuous model has been developed and tested using data from Yarralumla Creek catchment (Australian Capital Territory). This model simulates the soil moisture movement between storms and thus enables reasonable estimates of the antecedent conditions for any event. The infiltration component uses the Green-Ampt model, extended to simulate redistribution, and uses the Road Research Laboratory method for routing from previous and impervious areas. (CSIRO)
W77-00949

KINEMATIC WAVE THEORY APPLIED TO STORMFLOW FROM A MOUNTAIN CATCHMENT,
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 4C.
W77-00950

THE APPLICATION OF THE SACRAMENTO RAINFALL MODEL TO A LARGE ARID CATCHMENT IN WESTERN AUSTRALIA,
Snowy Mountains Engineering Corp., Cooma (Australia).
G. P. Codner, and F. M. J. Ribeny.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia,

Preprints of Papers, p. 98 - 102, June 1976. 4 fig., 3 tab., 6 ref.

Descriptors: *Arid climates, *Large watresheds, *Rainfall-runoff relationships, *Model studies, *Australia, Streamflow forecasting, Design flood, Spillways, Evapotranspiration, Antecedent moisture content, Unit hydrographs, Arid lands.
Identifiers: *Fortescue River(WA).

Use of the Sacramento rainfall runoff model is described for the Fortescue catchment in the northwest of Western Australia. The objectives of the study were the extension of the observed streamflow sequence and estimation of the spillway design flood at Gregory Gorge. These were achieved by calibrating the model, on a daily basis, on eight years of recorded data, then using the parameters in a 6-hourly version to calibrate a unit hydrograph from observed flood data. It is concluded that potential evapotranspiration estimates were less important than in a temperate climate. The amount of impervious area is important for low and medium runoff events as this represents the only runoff contribution. Flood estimates were found to be sensitive to assumptions on initial conditions of the soil moisture stores and the unit hydrograph chosen. (CSIRO)
W77-00951

2B. Precipitation

STATISTICAL MODELS FOR PRECIPITATION,
Kentucky Water Resources Research Inst., Lexington.
Z. Govindarajulu, P. Purdue, and F. Ciochi.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-259 270, Price codes; A03 in paper copy, A01 in microfiche. Research Report No. 96, August, 1976. 39 p, 10 tab, 13 ref. OWRT A-055-KY(1). 14-31-0001-5017. 14-34-0001-6018.

Descriptors: *Rainfall disposition, *Kentucky, *Rainfall intensity, *Simulated rainfall, *Distribution patterns, *Model studies, Precipitation(Atmospheric).

Available data consist of daily rainfall for the past 24 years (1948-1972) for Lexington, Louisville and Paducah. For Ashland the data are available for the period of 40 years (1932-1972). The problem is to find an appropriate family of distributions indexed by a suitable number of parameters that fits the maximum daily rainfall. Further, there might be seasonal variations. The following seasons were considered: (1) Dry Convective season: August 1-October 30; (2) Early Convective season: May 1-July 31; (3) Late Convective season: November 1-April 30. After extracting the yearly maximums for each of these seasons fittings were made of three distributions for each station; one for each season. The first attempt was to fit Gumbel's type I extreme value distributions, differing in location and scale parameters, to the maximum daily rainfall. However, the type I model for Louisville was rejected. Next, the Cauchy type of extreme value distribution was considered and an equation was derived. A separate model should be fitted for each of the stations, namely Lexington, Louisville, Ashland and Paducah. A separate model can also be used for each season. It seems reasonable to combine into a single season the Early and Late seasons for Lexington, the Dry and Early seasons for Louisville and Paducah, and all the seasons into a single season for Ashland.
W77-00537

ITERATIVE METHOD OF DETERMINING AQUIFER CONSTANTS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Journal of the Irrigation and Drainage Division, Proceedings of ASCE, Vol. 101, Paper No. IR1, p 81-85, March 1975. 1 fig, 1 ref, 2 append.

Descriptors: *Aquifer characteristics, *Aquifers, *Aquifer testing, *Mathematical studies, *Theis equation, Methodology.
Identifiers: Iterative method.

In the proposed method, it is possible to consider as many terms in the series of the generalized equation as may be significant for calculating the aquifer constants. Therefore, the method can be considered as a refinement or extension of Jacob's method in which only the first two terms of the series are considered. It can be compared with the Theis method in which the 'match' of the drawdown curve with the type curve is obtained graphically. In the proposed method, the 'match' is obtained algebraically. The aquifer constants determined by the proposed method satisfy the generalized equation for the two selected values of s and r2/t. Because the two points are selected from a smooth curve passing through the test data, the fit generally is good at all the other points also. (Skogerboe-Colorado State)
W77-00555

RAINFALL VARIATIONS AS INFLUENCED BY WIND AND TOPOGRAPHY,
Michigan State Univ., East Lansing. Dept. of Agricultural Engineering.
G. E. Merva, N. D. Strommen, and E. H. Kidder.
Journal of Applied Meteorology, Vol. 15, No. 7, p 728-732, July 1976. 6 fig, 2 tab, 6 ref.

Descriptors: *Rainfall, *Rain gages, *Measurement, *Michigan, Watersheds(Basins), Precipitation(Atmospheric), Winds, Topography, Seasonal, Meteorological data, Meteorology.
Identifiers: *Rainfall variations, *Deer-Sloan Creek(Mich), Wind effects, Rain gage exposure.

Precipitation catch variation as influenced by wind direction and speed, topography, and season was examined for the Deer-Sloan Creek watershed, located about 10 mi southeast of Michigan State University, East Lansing. Data for a 10-year period from dual traverse recording rain gages, calibrated twice a year, were ranked for each precipitation event by wind direction and speed. The annual frequency distribution of first-place rankings was arrayed by wind direction and speed to assess the possible influence of surrounding terrain on gage catch. A strong correlation was found to exist between the gage exposure and the surrounding topography as a function of the first-place rankings. (Sims-ISWS)
W77-00647

ICE-BEARING CUMULUS CLOUD EVOLUTION: NUMERICAL SIMULATION AND GENERAL COMPARISON AGAINST OBSERVATIONS,
Rand Corp., Santa Monica, Calif.
L. R. Koenig, and F. W. Murray.
Journal of Applied Meteorology, Vol. 15, No. 7, p 747-762, July 1976. 8 fig, 24 ref, 2 append. Navy N00228-75-C-2121, NSF DES 75-03459.

Descriptors: *Model studies, *Cloud physics, *Precipitation(Atmospheric), Mathematical models, Simulation analysis, Computer models, Clouds, Drops(Fluids), Ice, Crystals, Rime, Nucleation, Particle size, Cloud seeding, Rainfall, Meteorology.
Identifiers: *Cloud models.

A two-dimensional (axisymmetric) numerical cloud model with parameterized microphysics for water drops and ice particles was described. The parameterized liquid-phase processes included condensation, evaporation, autoconversion of small drops to large ones, and collection of small drops by large ones. The solid-phase processes included heterogeneous sorption nucleation, homogeneous contact nucleation, deposition sublimation, riming and melting. Both liquid and solid particles may precipitate. The model was used to simulate three different conditions of ice generation as a function of temperature: (1) based on classical concepts of the activity of heterogeneous ice-forming nuclei--suggesting continental cumuli; (2) based on field observations of much greater concentrations of ice particles at warmer temperatures than indicated measurements of heterogeneous ice nuclei--suggesting maritime cumuli; and (3) based on nucleus seeding practice when the goal is to stimulate the growth of cumulus clouds. General comparisons of model simulation against observation were satisfactory and showed that the microphysical parameterization capture many of the observed properties of glaciating clouds with regard to the locations and sizes of liquid and solid hydrometeors. The variation of hydrometeor properties with time was reasonably satisfactory although no single simulation properly captured the sequence of hydrometeor evolution observed in maritime cumuli. The results supported the concept of dynamic seeding to stimulate cloud growth but suggested caution with regard to equating greater vertical growth and greater rainfall on the ground. (Sims-ISWS)
W77-00648

FINESTRUCTURE AND MICROSTRUCTURE OBSERVATIONS DURING THE PASSAGE OF A MILD STORM,
Washington Univ., Seattle. Dept. of Oceanography; and Washington Univ., Seattle. Applied Physics Lab.
For primary bibliographic entry see Field 2L.
W77-00653

TRENDS AND PERIODICITIES OF RAINFALL IN SUB-DIVISIONS OF MAHARASHTRA STATE,
Meteorological Office, Poona (India).
V. K. Raghavendra.
Indian Journal of Meteorology and Geophysics, Vol. 25, No. 2, p 197-210, April 1974. 11 fig, 3 tab, 6 ref.

Descriptors: *Rainfall, *Distribution patterns, *Frequency analysis, Monsoons, Seasonal, Annual, Data processing, Rainfall disposition, Precipitation(Atmospheric), Rain, Precipitation intensity, Rainfall intensity, Meteorological data, Weather data, Analytical techniques, Meteorology.
Identifiers: *India, *Maharashtra State(India), *Rainfall trends.

The Maharashtra State of India is divided into four meteorological subdivisions, Konkan, Madhya Maharashtra, and Vidarbha. Of these, Madhya Maharashtra and Marathwada are prone to droughts. For all the subdivisions the principal rainy season is the monsoon season of June to September when over 80% of the annual rainfall is received. The coefficient of variation is about 20% for the annual and monsoon rainfall except for Marathwada where it is 25%. The annual and monsoon rainfalls follow the normal distribution for their yearly frequencies. In this State, the annual and the monsoon rainfall series are highly correlated. In the less drought-prone subdivision of Konkan, the annual and monsoon rainfalls show a 100-year cycle. In all the subdivisions the successive years' rainfalls are not dependent. The trend as revealed by fitting of orthogonal polynomials was shown as a quadratic curve for the annual and monsoon rainfalls of Konkan and Madhya Maharashtra, the subdivisions on either side of the Western Ghats. The low pass filter and Mann Kendall test against randomness confirmed the trend in Konkan rainfall. The power spectral analysis of the data indicated the existence of a long term, slow increasing trend for monsoon rainfall of Konkan and 60-year cycle for the annual rainfall of Konkan and Madhya Maharashtra, 30-year

ycle for the annual and monsoon rainfall of Vidarbha, 20nyear cycle for the monsoon rainfall of Marathwada, 15-year cycle for the monsoon rainfall of Madhya Maharashtra, 7.5-year cycle for he annual and monsoon rainfall of Marathwada. Sims-ISWS)
W77-00661

AN EXPERIMENT IN THE PRODUCTION OF 'POP' FORECASTS USING A STATISTICAL MODEL,
National Weather Service, Honolulu, Hawaii. Pacific Region.
G. Hirata.
NOAA Technical Memorandum NWSTM PR-15, September 1976. 16 p, 5 fig, 1 tab, 5 ref, 2 append.

Descriptors: *Statistical models, *Precipitation(Atmospheric), *Forecasting, *Rainfall, Weather data, Computer programs, *Hawaii, *Model studies.
Identifiers: 'POP' forecasts.

In November 1971, the National Weather Service in Hawaii commenced production of subjective 'POP' (probability of precipitation) forecasts for four Hawaiian weather stations: Hilo on the island of Hawaii; Kahului, Maui; Honolulu, Oahu; and Lihue, Kauai. This paper describes the method used in producing these forecasts and presents some of the results of the experiment. The computer program consisted of: a program for estimating the parameters in the logistic function (by maximum likelihood involving non-linear iterative techniques); and prediction of the probability of precipitation using estimated coefficients on current observed data. Independent parameters decided upon after testing were: sea level pressure; temperature of the air; dew point; and the presence or absence of precipitation at the time of observation. In almost all of the forecast periods, the probabilities were mainly in the lower and upper ranges, from 20-40% and 70-90% respectively, and these were quite reliable. In the mid-levels, however, the computer had a tendency to overforecast. (NOAA)
W77-00889

A RECORD ARKANSAS RAINFALL - THE EL DORADO DELUGE,
National Weather Service, Fort Worth, Tex. Southern Region.
K. M. Labas.
NOAA Technical Memorandum NWS SR-86, August 1976. 17 p, 5 fig.

Descriptors: *Precipitation excess, Evaporation, Convection, Meteorological data, Rainfall, Entrainment, Storms, *Arkansas, *Rainfall intensity.
Identifiers: Evaporative cooling, Convective downdrafts, El Dorado(Ark).

During the four day period 5-8 June, 1974, much of the Southern Plains and Lower Mississippi Valley was struck by a series of violent storms including killer tornadoes, severe thunderstorms and floods. One significant facet of the outbreak was the occurrence of over 18 inches (45 cm) of rain in less than 12 hours in Union County Arkansas. This phenomenal release, proceeding the absence of any apparent terrain interaction, was quite unexpected and is the subject of this investigation. The data reveals additional circumstances which were present over the impact area and may have had a significant role to play. These include: (1) a persistent dome of low theta w air near the surface in south Arkansas which was initiated by an afternoon squall meso-system and perpetuated through the night by evaporative cooling and convective downdrafts; (2) a very high and cold tropopause over the area; (3) the convective area, once formed, remained stationary with cells moving through it and; (4) massive cell diameters allowed minimal outside entrainment and maximum rain producing efficiency. The circumstance mainly responsible for the 18 inch release near El Dorado was the thrust of the moist Gulf air being lifted over the dome of low theta w air and simultaneously cooled aloft under the mid tropospheric short wave. (NOAA)
W77-00897

STATISTICAL, METEOROLOGICAL AND DEPTH-AREA ANALYSIS OF RAINFALL,
Israel Meteorological Service, Bet Dagan; and Israel Ministry of Transport and Communications, Tel-Aviv.
N. Rosenan, R. Markovitz, and Y. Shashua.
Final Report, (1976). 31 p, 4 tab, 17 ref. ESSA-E-4-67(N).

Descriptors: *Rainfall, *Forecasting, *Hydrologic data, *Meteorological data, Hydrology, Statistics, *Meteorology, Statistical methods.
Identifiers: International Hydrological Decade, *Mediterranean Sea, *Statistical analysis, Israel.

A research project was designed to cover several points of hydrometeorological research, for which it was thought that data available locally could be usefully applied, in order to assist in the solution of problems which are of general interest for the advancement of hydrology within the framework of the International Hydrological Decade. The program formulated provided statistical analysis of a long years (105 years) rainfall series and its application to hydrological middle-range and long-range forecasting: (1) the occurrence and disappearance of 'singularities', according to portions of the series (say, every 20 or 30 years); (2) fluctuations in the distribution of daily rainfall according to magnitude within the 105 years of record; (3) conclusion: applicability of the results to hydrological considerations. Correlations between rainfall in the Central Mediterranean and in the Eastern Mediterranean, and possible explanation by typical configurations of the 500 mb surface could give tools for long-range precipitation forecasts. (NOAA)
W77-00900

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME II. PHYSICAL OCEANOGRAPHY AND METEOROLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00911

BOUNDARIES OF ARID REGIONS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 7C.
W77-01032

2C. Snow, Ice, and Frost

WATER RESOURCE AUGMENTATION IN THE SOUTHWEST.
For primary bibliographic entry see Field 3B.
W77-00546

SEASONAL SNOW ACCUMULATION, MELT AND WATER INPUT--A NEW ENGLAND MODEL,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W77-00646

ICE-BEARING CUMULUS CLOUD EVOLUTION: NUMERICAL SIMULATION AND GENERAL COMPARISON AGAINST OBSERVATIONS,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2B.
W77-00648

DEPOSITS FORMED BY SUBGLACIAL PRECIPITATION OF CAC03,
California Univ., Los Angeles. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-00658

INFLUENCE OF ICE UPON CONSTRUCTION, AND METHODS OF COMBATTING ICE PROBLEMS.
Army Cold Region Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 8A.
W77-00663

AIRFLOW PATTERNS AND SNOW ACCUMULATION IN A FOREST CLEARING,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W77-00726

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 1. MARINE MAMMALS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00901

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 14. ICE.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00914

2D. Evaporation and Transpiration

THERMAL DISTURBANCES OF WHEAT WATER METABOLISM IN MODELS OF NATURAL METEOROLOGICAL COMPLEXES, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Soil Sciences and Agrochemistry.
For primary bibliographic entry see Field 3F.
W77-00755

SUSPENDED SEDIMENT, SOLAR RADIATION AND HEAT IN AGRICULTURAL RESERVOIRS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W77-00809

WATER USE ON RANGELANDS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 3B.
W77-00846

ACCURACY OF EVAPOTRANSPIRATION RATES DETERMINED BY THE WATER-BUDGET METHOD, GILA RIVER FLOOD PLAIN, SOUTHEASTERN ARIZONA,
Geological Survey, Tucson, Ariz.
R. L. Hanson, and D. R. Dawdy.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $1.05. Professional Paper 655-L 1976. 35 p, 17 fig, 20 tab, 13 ref.

Descriptors: *Evapotranspiration, *Flood plains, *Arizona, *Hydrologic budget, *Statistical methods, Reliability, Vegetation, Phreatophytes, Hydrologic data, Precipitation(Atmospheric), Riparian water loss, Soil moisture, Surface-groundwater relationships, Water balance.
Identifiers: Southeastern Arizona.

Evapotranspiration by phreatophytes (primarily saltcedar) was determined by the water-budget method for 5,500 acres (2,230 ha) of the Gila River flood plain in southeastern Arizona. The water budget consists of 12 components including surface and subsurface flow through the study area, precipitation on the area, and soil-moisture changes in the unsaturated soil profile. Nine years (1963-71) of hydrologic data were collected on four reaches within the area. These data provided over 400 measurements of evapotranspiration for two- or three-week periods. Midway through the study the vegetation was removed from the flood plain. The evapotranspiration measurements are therefore defined for both natural vegetative cover and essentially bareground conditions. This report shows how each component of the water budget was evaluated, demonstrates the significance of each component in relation to the total evapotranspiration, and describes the methods used to evaluate the relative accuracy of each component. The two most significant components of the water budget are, generally, the Gila River inflow and outflow. One of the least significant is tributary inflow, which occurred only 4 percent of the time during the 9-year study. Large computed measurement errors are shown to overestimate substantially the true measurement variable in evapotranspiration. The computed errors do give, however, a good indication of the relative significance of each evapotranspiration value and provide a means of selecting those values which should be used in computing average evapotranspiration rates. (Woodard-USGS)
W77-00868

2E. Streamflow and Runoff

A STABLE ESTIMATOR FOR LINEAR MODELS: 2. REAL WORLD HYDROLOGIC APPLICATIONS,
Pavia Univ. (Italy).
L. Natale, and E. Todini.
Water Resources Research, Vol. 12, No. 4, p 672-676, August 1976. 7 fig, 4 ref.

Descriptors: *Unit hydrographs, *Flood routing, Hydrology, *Estimating, Surface runoff, Rainfall-runoff relationships, Forecasting, Analytical techniques, Equations, Model studies, Hydrologic data, *Model studies.
Identifiers: *Arno basin, *Sieve River, *Italy, Constrained estimator, Linear model.

Two examples flood routing through a confluence of two watercourses of the Arno basin and the rainfall-runoff process in the Sieve River basin, were presented to illustrate the application of a stable estimator for linear models. Six flood hydrographs were considered for the Arno basin, and the instantaneous unit hydrographs were obtained for the two watercourses assuming the phenomenon of wave propagation in the drainage network as linear. A constrained stable estimator was shown to yield the best results in evaluating the parameters. In the Sieve River basin, effective rainfall hyetographs and the surface runoff hydrographs were affected by errors because of the usual and somehow arbitrary methods used to separate the surface components of the inflow and outflow discharges. Mean instantaneous unit hydrographs were determined for both constrained and unconstrained estimators by using four to eight rainfall-runoff events. A constant superiority for the constrained estimator was demonstrated. (See also W77-00123) (Singh-ISWS)
W77-00640

FREE SURFACE FLOW IN A CHANNEL OF LARGE RELATIVE ROUGHNESS,
Technical Univ. of Istanbul (Turkey), Dept. of Hydraulics and Water Power.
M. Bayazit.
Journal of Hydraulic Research, Vol. 14, No. 2, p 115-126, 1976. 11 fig, 23 ref.

Descriptors: *Roughness(Hydraulic), *OPen channel flow, *Laboratory tests, *Boundary layer, Viscosity, Hydraulics, Analytical techniques, Turbulence, Flumes, Statistics, Equations, Flow, Friction.
Identifiers: *Hemispherical roughness elements, Velocity distribution, Relative roughness, Equivalent sand roughness.

Characteristics of free surface flow over a bed consisting of hemispherical roughness elements were studied in a laboratory model. Theoretical bottom of the channel was located at a distance of 35% of the diameter below the tops of hemispheres. Usual logarithmic laws were valid for velocity distribution and friction factor as long as flow depth was large relative to roughness height. Equivalent sand roughness of the bottom was equal to 2.5 times the diameter of hemispheres. At large values of relative roughness on the other hand, lower velocities were observed than the logarithmic law predicts, and friction factor also increased by as much as 50%. Intensity of turbulence fluctuations decreased with the increase of relative roughness. Probability density function of velocity fluctuations near the rough bed tended away from the normal distribution. (Singh-ISWS)
W77-00649

INTEGRAL-EQUATION ANALYSIS OF FLOWS OVER ERODING BEDS,
Mississippi Univ., University. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-00682

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA--VOLUME 2. BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-00857

HISTORY OF IRRIGATION AND CHARACTERISTICS OF STREAMFLOW IN NEBRASKA PART OF THE NORTH AND SOUTH PLATTE RIVER BASINS,
Geological Survey, Lincoln, Nebr.
F. B. Shaffer.
Open-file report 76-167, June 1976. 98 p, 10 fig, 14 ref.

Descriptors: *Streamflow, *Flow rates, *Irrigation canals, *Surface waters, *Nebraska, Hydrologic data, Flow characteristics, Probability, Statistical methods, Diversion, Irrigation, Water rights, History.

Statistics on streamflow for selected periods of time are presented for 28 gaging sites in the Nebraska part of the North and South Platte River basins. Monthly mean discharges, monthly means in percent of annual runoff, standard deviations, coefficients of variation, and monthly extremes are given. Also tabulated are probabilities of high discharges for 1 day and for 3, 7, 15, 30, and 60 consecutive days and of low discharges for 1 day and for 3, 7, 14, 30, and 60 consecutive days. All statistics are based on records that are representative of 1973 conditions of streamflow. Brief historical data are given for 27 of the principal irrigation canals diverting from the North and South Platte Rivers. (Woodard-USGS)
W77-00859

EFFECT OF SEQUENCE LENGTH N ON THE CHOICE OF ASSUMED DISTRIBUTION OF FLOODS,
Geological Survey, Reston, Va.
J. R. Wallis, N. C. Matalas, and J. R. Slack.
Water Resources Research, Vol 12, No 3, p 457-471, June 1976. 17 tab, 1 ref.

Descriptors: *Flood frequency, *Design floo
*Flood damage, *Numerical analysis, *Equation
Methodology, Hydrogeology, Design data.

Although overdesign and underdesign losses va
with the length n of flood sequences, the choice
flood frequency distribution for estimating t
design flood is not overly sensitive to n. Bias in t
estimate of the design flood does not account f
differences in the analytical forms of the under
ing and optimal assumed distributions of floo
(Woodard-USGS)
W77-00861

EFFECTS OF CHANGES IN AN ALLUVI CHANNEL ON THE TIMING, MAGNITUD AND TRANSFORMATION OF FLOOD WAVE SOUTHEASTERN ARIZONA,
Geological Survey, Menlo Park, Calif.
D. E. Burkham.
Available from the Supt. of Documents, GP Washington, DC 20402, Price $0.75. Geologi Survey Professional Paper 655-K, 1976. 25 p, fig, 2 tab, 21 ref.

Descriptors: *Open channel flow, *Alluvial cha
nels, *Channel morphology, *Flow rates, *Flo
discharge, Flash floods, Flood routing, Veloci
Meanders, Reservoir operation, Evaluatio
*Arizona.
Identifiers: *Gila River(Ariz), *Safford V
ley(Ariz), Flood-wave timing.

The stream channel of the Gila River in Saffo
Valley, Ariz., is wide and straight at ends
periods in which high flows were dominant and
narrow and has a meander pattern at ends
periods in which low flows were dominant; the
fore, the size and meander pattern of the stre
channel are regarded as having been determin
by past dominant flows. The stream-channel a
flood-plain system, when fully developed for
dominant flow, has a persistent characteristic
regard to its effect on floods. A low-flow syst
reduces flood rates; peak flows of flash floo
may be reduced to bankfull discharge. A high-fl
system does not increase flood rates; howeve
streamflow from tributaries may contribute mo
significantly to peak rates when a high-fl
system is in effect than when a low-flow system
in effect. At the downstream end of the stu
reach, the annual peak flows reflect the effects
the persistent characteristic of the upstre
system and, therefore, are not random in time.
high-flow system was in effect during 1914-27
low-flow system began developing after abo
1930. The downstream velocity of the center
mass of floodwaves that had peak discharges
between 10,000 and 20,000 cubic feet per seco
during 1914-27 may have been three times that
the same rates during 1943-70. (Woodard-USGS)
W77-00869

FLOOD-PLAIN DELINEATION FO CAMERON RUN BASIN, FAIRFAX COUNTY ALEXANDRIA CITY, VIRGINIA,
Geological Survey, Reston, Va.
P. L. Soule.
Open-file report 76-443, 1976. 94 p, 46 fig, 5 tab ref.

Descriptors: *Flood plains, *Mapping, *Flo
profiles, *Flood recurrence interval, *La
development, Watersheds(Basins), Urbanizatio
Forecasting, Urban hydrology, Projection
Floods, Maps, Contours, *Virginia.
Identifiers: *Fairfax County(V
*Alexandria(Va), Flood boundaries, 25-ye
flood, 50-year flood, 100-year flood, Cameron R
Basin(Va).

Flood-Plain Delineation for Cameron Run Bas
Water-surface profiles of the 25-, 50-, and 10
year recurrence interval discharges have be
computed for all streams and reaches of channe
in Fairfax County, Virginia, having a drainage ar

eater than 1 square mile except for Dogue reek, Little Hunting Creek, and that part of ameron Run above Lake Barcroft. Maps having 2-foot contour interval and a horizontal scale of 1 ch equals 100 feet have been used for a base on hich flood boundaries were delineated for 25-, -, and 100-year floods to be expected in each asin under ultimate development conditions. Inuded are techniques employed in computing scharges and profiles as well as the flood profiles d maps on which flood boundaries have been elineated for that part of Cameron Run basin elow Lake Barcroft in both Fairfax County and e city of Alexandria. (Woodard-USGS)
'77-00870

REQUENCY ANALYSIS OF FLOOD DATA IN UEENSLAND (AUSTRALIA),
epartment of Primary Industries, Brisbane ustralia).
or primary bibliographic entry see Field 4A.
'77-00936

HE MATHEMATICAL MODELLING OF IVERS,
leteorology Bureau, Brisbane (Australia). ydrometeorology Section.
or primary bibliographic entry see Field 2E.
'77-00941

HE MATHEMATICAL MODELLING OF IVERS,
leteorology Bureau, Brisbane (Australia). ydrometeorology Section.
.. J. Morris.
n: Hydrology Symposium, Sydney, Australia, 976. The Institution of Engineers Australia, reprints of Papers, p. 45 - 49, June 1976. 1 fig., 1 ab., 6 ref.

Descriptors: *Mathematical models, *Streamflow orecasting, *Flood routing, *Urban runoff, Computer models, Urban hydrology, Storm runoff, Channel flow, Roughness(Hydraulic), Unit hydrographs, Backwater, *Australia.
Identifiers: Brisbane(Qld.).

During a general study of flooding problems in reeks traversing the developed area of Brisbane Australia), a suite of computer programmes was roduced to give effect to a general mathematical odel. The model blends hydraulics with hydrology in using backwater profiles with flood routing nd variable unitgraph techniques. The balance etween hydrology and hydraulics has been found o be self-correcting to a degree, in that if the flow s consistently incorrect (e.g. a low initial rating urve), the roughness coefficients will be estiated high. The net result is that over a medium ange of flows the levels will be within an acceptale error margin. Details of the model and its comonent programmes are given, with some examles of its use. (CSIRO)
W77-00941

LOOD ENVELOPES AND FREQUENCIES FOR HE BRISBANE RIVER (AUSTRALIA),
risbane City Council (Australia). Dept. of Water upply and Sewerage.
or primary bibliographic entry see Field 4A.
W77-00942

TEINBECK V PHILIP STENGER SONS, INC ALTERATION OF HIGHER TOPOGRAPHY BY AND DEVELOPER CAUSING ARTIFICIAL RAINAGE ONTO LOWER PROPERTY--THE AKING ISSUE).
45 NE2d 633-40 (Ohio Ct App 1975). 8 p.

Descriptors: *Ohio, *Water courses(Legal spects), *Topography, *Drainage, *Judicial decions, Penalties(Legal), Water law, Adjacent land wners, Drainage effects, Controlled drainage, Legal aspects, Boundaries(Property), Common law, Developed waters, Drainage systems.
Identifiers: Proximate causation, Injunctive relief, Intentional torts.

Plaintiff owners of lower residential land brought suit for damages and injunctive relief against a developer-owner of higher lands alleging alterations of surface water drainage. The Ohio Court of Appeals held that an owner of a dominant urban estate cannot without liability alter natural watercourses on his property so that surface water flowing onto a subservient estate is so increased in volume or intensity as to damage that estate. An award of punitive damages was allowed. (Reinders-Florida)
W77-01049

2F. Groundwater

MODELING OF NONCONTINUOUS FORT UNION AND MESAVERDE SANDSTONE RESERVOIRS, PICEANCE BASIN, NORTHWESTERN COLORADO,
For primary bibliographic entry see Field 4B.
W77-00637

PARAMETER IDENTIFICATION IN AN INHOMOGENEOUS MEDIUM WITH THE FINITE-ELEMENT METHOD,
California Univ., Los Angeles.
Y. S. Yoon, and W. W-G. Yeh.
Society of Petroleum Engineers Journal, Vol. 16, No. 4, p 217-226, August 1976. 3 fig, 2 tab, 34 ref.
UCLA-WRC-W-290.

Descriptors: *Aquifer characteristics, *Permeability , *Heterogeneity, *Finite element analysis, Numerical analysis, Mathematical models, Optimization, Unsteady flow, Groundwater movement, Dupuit-Forchheimer theory, Porous media, Least squares method, Boundaries(Surfaces), Equations.
Identifiers: *Inverse problem, Parameter identification, Galerkin method, Predictor-corrector technique, Indirect method, Effective porosity, Gauss-Newton method.

The development of a systematic procedure for solving the problem of parameter identification was studied. The parameter function to be identified was the permeability embedded in nonlinear, partial differential equation of parabolic type. Finite elments were used to represent the unknown function parametrically in terms of nodal values over a suitable discretization of a flow region. These nodal values were then determined by a least-squares fitting between the observed and calculated flow potentials, subject to linear inequality constraints imposed upon the parameters to be identified. To handle such constraints, Rosen's gradient projection technique was combined with the Gauss-Newton method. Numerical procedures were presented for the solution of the partial differential equation using the Galerkin method and a predictor-corrector approach. Simultaneous identification of 25 parameters embedded in a two-dimensional, nonlnear, diffusion-type equation was demonstrated by two examples. (Visocky-ISWS)
W77-00638

EVALUATING GROUND-WATER PATHS USING HYDRAULIC CONDUCTIVITIES,
Agricultural Research Service, Chickasha, Okla. Texas-Oklahoma Area.
J. W. Naney, D.C. Kent, and E. H. Seely.
Ground Water, Vol. 14, No. 4, p 205-213, July-August 1976. 14 fig, 13 ref.

Descriptors: *Hydraulic conductivity, *Groundwater, *Oklahoma, *Groundwater movement, *Hydrogeology, Effluent streams, Flow nets, Mathematical models, Watersheds(Basins), Subsurface flow, On-site investigations, Computer programs, Potentiometric level, Seepage, Mapping, Cores, Pump testing, Particle size, Permeameters, Model studies.
Identifiers: *Flow paths(Groundwater), Residual maps, Streamtubes.

A method was presented for selecting groundwater flow paths by comparing modeled and measured hydraulic conductivity distributions. A flow chart was included which shows the steps followed in selecting the concept of roundwater flow which best fits measured hydrogeologic conditions. Both noneffluent and effluent stream conditions were evaluated using the method. Residual maps of hydraulic conductivity were used to show how modeled hydraulic conductivity may be as much as 300 times that expected when the wrong concept is used. Flow nets of modeled and measured data downstream from a flood-water-retarding structure were developed using the selected hydrogeologic conditions. Fitting hydraulic conductivity data resulted in a distribution of groundwater flow paths which better represent actual flow conditions. The method provided a unique means of calibrating a model in a pilot test area and applying it to geologically similar nearby watersheds. It was also useful for checking paths of subsurface flow where flow distribution is important as it is in the movement of chemical pollutants or nutrients from a source of recharge, such as a watershed impoundment, to downstream waters. (Visocky-ISWS)
W77-00651

HYDROGEOPHYSICAL EQUIVALENCE OF WATER SALINITY, POROSITY AND MATRIX CONDUCTION IN ARENACEOUS AQUIFERS,
National Physical Research Lab., Pretoria (South Africa). Geophysics Div.
P. F. Worthington.
Ground Water, Vol. 14, No. 4, p 224-232, July-August 1976. 4 fig, 9 ref.

Descriptors: *Resistivity, *Salinity, *Porosity, *Sand aquifers, Sands, Sandstones, Geophysics, Aquifer characteristics, Sodium chloride, Conduction, Equations, Groundwater, Mapping, Curves, Heterogeneity, Graphical analysis, Hydrogeology.
Identifiers: Formation factor, Rock matrix.

The value of the electrical resistivity method as a quantitative indicator of groundwater resistivity, porosity, and effective matrix resistivity was examined through the equivalence of these parameters as manifested in the surface-measured resistivity of heterogeneous water-saturated sands. It was demonstrated that, where there were unknown variations in porosity, the mapping of groundwater resistivity was most feasible at lower salinities and where porosity was relatively high. Porosity could be determined most exactly at lower values and where groundwater salinity was relatively high. Both of these approaches became less efficient as matrix conduction increased. The mapping of effective matrix resistivity was best effected at lower values where this parameter could be approximately monitored against moderate variations in both porosity and groundwater resistivity. In general, however, where there were unknown and pronounced variations in any two of these parameters, the geoelectrical determination of the third could be so ambiguous that the uncertainty in the estimated value of this parameter could exceed the total range of values encountered in an entire formation. (Visocky-ISWS)
W77-00652

GROUND-WATER LEVELS AND WELL RECORDS FOR DISCONTINUED OBSERVATION WELLS IN IDAHO, 1915-72: PART A,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-00854

GROUND-WATER LEVELS AND WELL RECORDS FOR DISCONTINUED OBSERVATION WELLS IN IDAHO, 1915-72: PART B,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-00855

GROUND-WATER LEVELS AND WELL RECORDS FOR DISCONTINUED OBSERVATION WELLS IN IDAHO, 1915-72: PART C,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-00856

HYDROGEOLOGY OF A DRIFT FILLED BEDROCK VALLEY NEAR LINO LAKES, ANOKA COUNTY, MINNESOTA,
Geological Survey, Denver, Colo.
T. C. Winter, and H. O. Pfannkuch.
Journal of Research of the U. S. Geological Survey, Vol 4, No 3, p 267-276, May-June 1976. 8 fig, 2 tab, 10 ref.

Descriptors: *Hydrogeology, *Groundwater movement, *Glacial aquifers, *Minnesota, Data collections, Observation wells, Aquifer characteristics, Surface-groundwater relationships, Water levels, Groundwater recharge, Transmissivity, Hydraulic conductivity.
Identifiers: *Anoka County(Minn), Bedrock valleys.

The bedrock surface of east-central Minnesota is dissected by an intricate network of valleys. These valleys, as much as several hundred feet deep and filled with drift, dissect important sandstone and carbonate-rock aquifers of lower Paleozoic age. A small segment of one of the valleys, in southeastern Anoka County (test site A), is about 335 ft deep and 260 ft below the bedrock surface. Outside the bedrock valley at site B, 3 mi from site A, 100 ft of drift overlies the bedrock surface. Observation wells were installed at the two sites to determine the vertical ground-water movement between the various aquifer units and the lateral movement between the two sites. An aquifer test of the lowest valley-fill aquifer at site A showed that the observation well completed in the same aquifer as the pumping well responded immediately; whereas a lag of about 100 min occurred between the lower valley fill and upper-most body of sand and gravel. This indicates that the hydraulic connection between these two layers is poor at the immediate site. Test results show that the lower sand-and-gravel aquifer has a transmissivity between 14,000 and 27,000 sq ft/d. Laboratory analyses of drill cuttings show fair agreement with the hydraulic conductivity derived from aquifer-test analyses. Water-level data for a 2-yr period indicate that there are no reversals in ground-water potential with time. (Woodard-USGS)
W77-00860

AVAILABILITY OF GROUND WATER IN THE AREA SURROUNDING THE TRIDENT SUBMARINE CONSTRUCTION FACILITY, KITSAP COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4B.
W77-00862

COMPUTER SIMULATION MODEL OF THE PLEISTOCENE VALLEYFILL AQUIFER IN SOUTHWESTERN ESSEX AND SOUTHEASTERN MORRIS COUNTIES, NEW JERSEY,
Geological Survey, Trenton, N. J.
H. Meisler.
Water-Resources Investigations 76-25, May 1976. 70 p, 3 fig, 1 plate, 3 tab, 14 ref.

Descriptors: *Aquifers, *Hydraulic properties, *Computer models, *Groundwater movement, Aquifer characteristics, *New Jersey, Pleistocene Epoch, Sands, Storage coefficient, Specific yield, Transmissivity, Water wells, Water yield, Glacial drift, Till, Gravels.
Identifiers: Passaic River(NJ), Morris County(NJ), Essex County(NJ), Newark group, Valley fill.

A finite-difference digital computer model was developed to simulate a buried valley-fill aquifer consisting of outwash sand and gravel deposited in a series of valleys cut into bedrock of Triassic age. Till, clay, silt, and muck function as an overlying semiconfining layer. The bedrock which is represented as an unconfined aquifer and the valley fill are in hydraulic connection. Calibration of the model was achieved by comparing model-computed water-level declines with measured declines at 12 observation wells during the period 1953-71. During calibration, changes in several hydraulic properties were tested. The most significant changes were changes in hydraulic conductivity of the semiconfining layer. The amount of water available from the valley-fill aquifer on a continuing basis, determined using the criterion that water levels would not decline below 30 feet above the base of the aquifer, is approximately 40 Mgal/d or about 40 percent more than the 1972-73 withdrawal rates. (Woodard-USGS)
W77-00865

GEOLOGY AND GROUND-WATER RESOURCES OF CAMDEN COUNTY, NEW JERSEY,
Geological Survey, Trenton, N. J.
G. M. Farlekas, B. Nemickas, and H. E. Gill.
Water-Resources Investigations 76-76, June 1976. 146 p, 50 fig, 14 tab, 84 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *New Jersey, Pumping, Drawdown, Water yield, Water utilization, Water wells, Chemical analysis, Groundwater recharge, Groundwater movement, Saline water intrusion, Atlantic coastal plain.
Identifiers: *Camden County(NJ).

The major fresh water aquifers in Camden County, N. J., are in the unconsolidated sediments of Cretaceous and Tertiary age. The major aquifers are the sand and gravel units in the Potomac Group and the Raritan and Magothy Formations, the Cohansey Sand, the Wenonah Formation-Mount Laurel Sand, and the Englishtown Formation. The average ground-water use for Camden County was 68 million gallons per day for 1966. All of the major artesian aquifers have had potentiometric head declines due to ground-water withdrawals. The largest water-level decline occurred in the aquifer system in the Potomac Group and the Raritan and Magothy Formations. At Haddon Heights the potentiometric head declined over 110 feet from 1900 to 1968. In the aquifer in the Wenonah Formation-Mount Laurel Sand the potentiometric head declined 43 feet in about 60 years. The quality of ground water is generally good. In the southeastern portion of the county chloride concentrations in excess of 250 mg/liter occur in the Potomac-Raritan-Magothy aquifer system. The high chloride water has remained in the aquifer system from the time of deposition or has re-entered the system from the ocean after the changes in sea level. The greatest potential of future ground-water development is from the Cohansey Sand which is under water table conditions. It also may have the greatest possibility of local ground-water contamination. (Woodard-USGS)
W77-00866

2G. Water In Soils

ON RADIOACTIVE WASTE MANAGEMENT: AN ANALYSIS OF THE PARAMETERS CONTROLLING SUBSURFACE CONTAMINANT TRANSFER,
Alberta Univ., Edmonton. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-00551

MIGRATION OF SALT FROM FEEDLO WASTE AS AFFECTED BY MOISTUR REGIME AND AGGREGATE SIZE,
Arizona Univ., Tucson. Dept. of Soils, Water a Engineering.
For primary bibliographic entry see Field 5B.
W77-00558

NITROGEN TRANSFORMATIONS OF A MONIUM SULFATE AND ALANINE IN SU MERGED MAAHAS CLAY,
Philippines Univ., College. Coll. of Agriculture.
For primary bibliographic entry see Field 5B.
W77-00639

HYDRAULIC FUNCTIONS OF SOILS FRO PHYSICAL EXPERIMENTS AND THEIR A PLICATIONS,
Oregon State Univ., Corvallis. Dept. of Agric tural Engineering.
R. H. Brooks, and C. Su.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-259 5 Price codes: A07 in paper copy, A01 in microfich Oregon Water Resources Research Institute, C vallis, Completion Report WRRI-41, May 19 130 p, 18 fig, 57 ref, 4 append. 10. OWRT 5270(No. 4218)(1).

Descriptors: Hydraulics, *Saturation, Soils, *Po pressure, *Distribution patterns, *Permeabilit Retention, *Soil physical properties, *Soil wa movement.
Identifiers: *Pearson Type VIII distribution fun tion, *Pore-size distribution function, Imbibition

Based upon the Pearson Type VIII distributi function, a general retention function which lates the saturation to the capillary pressure disturbed soils has been discovered. This simp and yet complete function has been shown describe precisely the imhibition as well as t drainage branch of the retention curve. It defined by four readily assessed parameters th either have physical significance themselves may be used to determine some hydraulic prope ties of the soil. With the assumption that the Bu dine integrals are adequate, a relative permeabili function has been derived through the substituti of the retention function for the integrands in t Burdine integrals. The permeability function is e pressed in terms of the incomplete Beta functi ratio whose value may be conveniently found some mathematical tables. Further, a general por size distribution function of soils has been o tained from the retention function. The derivati of the pore-size distribution function enables mo rigorous examination and further exploration the theories concerning water movement in pa tially saturated soils. In this respect, and explan tion of the phenomenon of air entrapment duri imbibition has been offered through an ener concept based upon the pore-size distributi function along with the retention function.
W77-00667

EXPERIMENTS TO INVESTIGATE SUBSTA TIAL LOAD OF SOILS AND TO PREDICT TH LONG TERM EFFECTS OF WASTES O GROUND WATER, (IN GERMAN),
Ministry of Agricultural Experiment Statio Brunswick (West Germany).
For primary bibliographic entry see Field 5B.
W77-00703

EROSION POTENTIAL OF SOILS,
Soil Conservation Service, Washington, D.C. So Survey Interpretations Div.
For primary bibliographic entry see Field 2J.
W77-00776

OIL RIPPING TREATMENTS FOR RUNOFF ND EROSION CONTROL,
orest Service (USDA), Albuquerque, N. M. ocky Mountain Forest and Range Experiment tation.
or primary bibliographic entry see Field 4D.
/77-00795

IILD SLOPE STABLE CHANNELS. A TOCHASTIC DESIGN APPROACH,
lorida Univ., Gainesville. Dept. of Civil Engineering.
or primary bibliographic entry see Field 2J.
/77-00896

OILS OF THE MESHED TRACT IN OUTHWESTERN TURKMEN SSR, (IN RUSIAN),
esert Inst., Ashkhabad (USSR).
. B. Karryev.
robl Osvoeniya Pustyn' 2, p 47-53. 1975.

escriptors: *Soil physical properties, *Soil hemical properties, *Soil erosion, Grazing, Erosion control.
dentifiers: *Turkmen-SSR, USSR.

he morphological physico-chemical and chemical roperties of the soils were studied. To improve tilization of the land for grazing, water supply nd soil erosion control of the massif should be insified.--Copyright 1976, Biological Abstracts, nc.
V77-00975

FFECT OF SOIL MOISTURE ON DELIVERY F NITROGEN-15 TO WINTER WHEAT LANTS, (IN RUSSIAN),
kademiya Nauk URSR, Kiev. Institut Fiziologii astenii i Agrokhimii.
. S. Tkachuk, S. I. Slukhai, P. S. Kirnos, and M. . Grinchuk.
iziol Biokhim Kul't Rast 7(3), p 261-265, 1975.

escriptors: *Soil moisture, *Nitrogen, *Wheat, rought, Moisture content, Aging, Vegetation.
dentifiers: England, *Nitrogen-15, Winter wheat.

sudden soil drought releases delivery of 15N nto the above ground organs of wheat. Under conitions of constant moisture deficit in soil the daptive reactions in young plants results in a high ntensity of N renewal. At the end of vegetation he processes weaken, due to early aging.--Copyight 1976, Biological Abstracts, Inc.
V77-01035

2H. Lakes

N INVESTIGATION INTO THE EFFECT AND AUSE OF EUTROPHICATION IN GEORETOWN LAKE, MONTANA,
Iontana State Univ., Bozeman. Water Resources esearch Center.
or primary bibliographic entry see Field 5C.
V77-00536

LIPHATIC HYDROCARBONS IN SEDIMENTS F LAKE WASHINGTON,
Vashington Univ., Seattle. Dept. of Chemistry.
or primary bibliographic entry see Field 5A.
V77-00643

URFACE NORMAL MODES OF LAKE MICHIGAN: CALCULATIONS COMPARED WITH SPECTRA OF OBSERVED WATER EVEL FLUCTUATIONS,
lational Oceanic and Atmospheric Administraion, Ann Arbor, Mich. Great Lakes Environmenal Research Lab.
). B. Rao, C. H. Mortimer, and D. J. Schwab.
Journal of Physical Oceanography, Vol. 6, No. 4, p 575-588, July 1976. 9 fig, 4 tab, 11 ref.

Descriptors: *Water level fluctuations, *Lake Michigan, *Lakes, *Wisconsin, *Model studies, Mathematical models, Water levels, Bays, Tides, Seiches, Fluctuations, Limnology.
Identifiers: *Water oscillations, *Green Bay(Wis), Surface normal modes, Spectra of water levels, Galerkin method.

Periods and structures of several normal modes of Lake Michigan (including Green Bay) were calculated theoretically, taking into account the Lake's topography and the earth's rotation. The calculations were based on a Galerkin method developed by Rao and Schwab. Even though the calculations gave both rotational and gravitational modes, attention was focused primarily on the latter. The calculations showed that there were several modes dominant in the main basin of Lake Michigan and some dominant in Green Bay. The lowest Lake Michigan mode had a period of 9.27 h. Green Bay exhibited a (co-oscillating or Hemlholtz) mode with a period 10.35 h. For the modes dominant in the main basin, the periods and structures obtained from theoretical calculations were compared to those deduced from spectral analyses of water level data from various stations around the Lake. The agreement was found satisfactory for several of the lowest modes. (Sims-ISWS)
W77-00655

STRATIFIED WATERS AS A KEY TO THE PAST,
Hamburg Univ. (West Germany). Geologisch-Palaontologisches Institut.
For primary bibliographic entry see Field 2J.
W77-00659

IMPROVING THE QUALITY OF WATER RELEASES FROM RESERVOIRS BY MEANS OF A LARGE DIAMETER PUMP,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-00668

DEMONSTRATION OF WATER QUALITY ENHANCEMENT THROUGH THE USE OF THE GARTON PUMP,
Oklahoma Water Resources Research Inst. Stillwater.
For primary bibliographic entry see Field 5G.
W77-00669

SEDIMENT CHARACTERISTICS AND THE TROPHIC STATUS OF FOUR OREGON LAKES,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W77-00673

AN AQUEOUS ENVIRONMENTAL SIMULATION MODEL FOR MID-SOUTH LAKES AND RESERVOIRS,
Arkansas Univ., Fayetteville. Coll. of Engineering.
For primary bibliographic entry see Field 5C.
W77-00675

PLANKTONIC CRUSTACEA OF THE RESERVOIR OF CUBILLAS NEAR GRANADA, (IN SPANISH),
Granada Univ. (Spain). Lab. of Ecology; and Granada Univ. (Spain). Dept. of Zoology.
R. M. Martinez-Silvestre.
Cuad Cienc Biol Univ Granada 3, p 5-14, 1974.

Descriptors: *Copepoda, *Crustaceans, Plankton, Reservoirs, Europe, *Daphnia.
Identifiers: Alona-rectangula, Bosmina-longirostris, Ceriodaphnia-reticulata, Cubillas, Daphnia-hyalina, Daphnia-longispina, Megacyclops-viridis-viridis, Tropocyclops-prasinus, *Granada(Spain).

The 7 existing species, 2 of which belong to the Copepods and the other 5 to the Cladocera classified. The relative abundance of each species, in the samples of superficial net plankton were taken periodically for 1 yr. The existing species are: Copepoda: Megacyclops viridis viridis and Tropocyclops prasinus; Cladocera: Ceriodaphnia reticulata, Bosmina longirostris, Daphnia longispina, D. hyalina and Alona rectangula.--Copyright 1976, Biological Abstracts, Inc.
W77-00683

THE SEDIMENTS OF LAKE GEORGE (UGANDA). I: REDOX POTENTIALS, OXYGEN CONSUMPTION AND CARBON DIOXIDE OUTPUT,
Malaya Univ., Kuala Lumpur (Malaysia). School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-00712

SOME THEORETICAL CONSIDERATIONS OF THERMAL DISCHARGE IN SHALLOW LAKES,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
For primary bibliographic entry see Field 5C.
W77-00716

PHYTOPLANKTON SUCCESSION IN A MATURING NORTHWEST TEXAS RESERVOIR (LAKE MEREDITH),
West Texas State Univ., Canyon. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-00720

NUMERICAL MODELS OF LAKE CURRENTS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 5B.
W77-00722

WATER POLLUTION INVESTIGATION: ERIE, PENNSYLVANIA AREA,
Betz Environmental Engineers, Inc., Plymouth Meeting, Pa.
For primary bibliographic entry see Field 5C.
W77-00724

SEDIMENTATION IN BIRCH LAKE, IOWA COUNTY, WISCONSIN,
Soil Conservation Service, Madison, Wis.
For primary bibliographic entry see Field 2J.
W77-00785

SUSPENDED SEDIMENT, SOLAR RADIATION AND HEAT IN AGRICULTURAL RESERVOIRS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W77-00809

LAKE POWELL SEDIMENTATION SURVEYS,
Bureau of Reclamation, Salt Lake City, Utah. Div. of Planning.
For primary bibliographic entry see Field 2J.
W77-00819

THE MACROPHYTE VEGETATION OF FIVE LAKES IN VEFSN, NORDLAND COUNTY, NORTH NORWAY, (IN NORWEGIAN),
For primary bibliographic entry see Field 5C.
W77-00823

DISTRIBUTION OF RESERVOIR SEDIMENT--IOWA AND MISSOURI DEEP LOESS HILLS,
Agricultural Research Service, Columbia, Mo. North Central Watershed Research Center.
For primary bibliographic entry see Field 2J.
W77-00825

SEDIMENT DISPERSAL IN WESTERN LAKE MICHIGAN NEAR TWO CREEKS, WISCONSIN, AND THE INFLUENCE OF AN INDUSTRIAL COOLING WATER DISCHARGE,
Wisconsin Univ., Madison. Sea Grant Program; and Wisconsin Univ., Madison. Geo-Environmental and Mineral Resources Program.
For primary bibliographic entry see Field 2J.
W77-00841

COASTAL EROSION IN EASTERN LAKE MICHIGAN,
University of South Florida, Tampa. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-00842

SOURCES OF ARSENIC IN STREAMS TRIBUTARY TO LAKE CROWLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W77-00867

THE TEMPERATURE OF TWO WELSH LAKES AND ITS EFFECT ON THE DISTRIBUTION OF TWO FRESHWATER INSECTS,
University Coll. of North Wales, Bangor. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-00878

REVEALING CERCARIA OF THE FAMILY SCHISTOSOMATIDAE IN THE KIEV WATER RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W77-00881

THE EFFECT OF GRAVEL DREDGING ON RESERVOIR PRIMARY PRODUCTION, INVERTEBRATE PRODUCTION, AND MUSSEL PRODUCTION.
Tennessee Wildlife Resources Agency, Nashville.
For primary bibliographic entry see Field 5C.
W77-00895

AQUATIC OLIGOCHAETA RECOREDED FROM CANADA AND THE ST. LAWRENCE GREAT LAKES,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
R. O. Brinkhurst.
Pacific Marine Science Report 76-4, January 1976. 51 p. 7 plates, 20 ref.

Descriptors: *Aquatic animals, *Canada, *Oligochaetes, *Systematics, Speciation, Tubificids, *Annelids, Worms, *Great Lakes.
Identifiers: *Lumbriculidae, *Haplotaxidae. *Naididae.

A systematic classification of annelids (Oligochaeta), including Lumbriculidae, Haplotaxidae and Naididae found in Canada is presented. It gives the Canadian locale where found, a description of familial characteristics, and a guide to identification of the various species. Plates illustrate setae, penes, and proboscises. (Auen-Wisconsin)
W77-00925

ASBESTOS IN THE GREAT LAKES BASIN WITH EMPHASIS ON LAKE SUPERIOR, A REPORT TO THE INTERNATIONAL JOINT COMMISSION FROM THE GREAT LAKES RESEARCH ADVISORY BOARD.
International Joint Commission-United States and Canada, Windsor (Ontario). Great Lakes Water Quality Board.
For primary bibliographic entry see Field 5B.
W77-00927

CLADOPHORA IN THE GREAT LAKES,
Limnos Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5C.
W77-00928

AN APPROACH TO A RELATIVE TROPHIC INDEX FOR CLASSIFYING LAKES AND RESERVOIRS. (A PRELIMINARY ANALYSIS OF NATIONAL EUTROPHICATION SURVEY DATA COLLECTED DURING THE 1972 SAMPLING PERIOD).
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-00930

A PLAN FOR MICHIGAN'S SHORELANDS.
Michigan Dept. of Natural Resources, Lansing.
For primary bibliographic entry see Field 6B.
W77-00958

INSTITUTIONAL ARRANGEMENTS FOR LAKE MANAGEMENT IN WISCONSIN,
Wisconsin Univ., Madison. Environmental Resources Unit.
For primary bibliographic entry see Field 6E.
W77-00966

CORPORATE RESPONSIBILITY IN SILVER BAY,
For primary bibliographic entry see Field 5G.
W77-00980

INDEPENDENCE OF THE BIOCHEMICAL AND SPECIES COMPOSITION OF PLANKTON OF THE MINGECHAUR AND VARVARA RESERVOIRS, (IN RUSSIAN),
S. B. Gadzhieva.
Izv Akad Nauk Az Ssr Ser Biol Nauk 4, p 72-79, 1974.

Descriptors: *Biochemistry, *Copepods, *Zooplankton, Reservoirs, *Daphnia, *Phytoplankton.
Identifiers: Arctodiaptomus-acutilobatus, Azerbaijan-SSR, Cyclops-vicinus, Daphnia-longispina-hyalina, Diaphanosoma-brachyurum, Macrocyclops-fuscus, Mesocyclops-dybowskii, Sinodiaptomus-sarsi, USSR, *Mingechaur Reservoir(USSR), *Varvara Reservoir(USSR).

Data are presented on the biochemical composition and calorific values of the dominant species or groups of species of plankton in the Mingechaur and Varvara reservoirs in the Azerbaijan SSR (USSR): Diatomeae, Nitzschia, Diaphanosoma brachyurum, Daphnia longispina hyaiina, Sindiaptomus sarsi, Arctodiaptomus acutilobatus, Mesocyclops dybowskii, Cyclops vicinus, Macrocyclops fuscus and nauplii of copepods. The calorific value of the zooplankton was almost twice higher than that of the phytoplankton; if the average calorific value of the phytoplankton was equal to 2.45, then that of copepods was 4.78 and of cladocerans 4.67 kcal/g dry matter.
W77-01018

PHYSICAL-CHEMICAL AND PLANKTONOLOGICAL QUANTITATIVE STUDIES OF

THE GREAT LAKE OF LAFFREY (YEA 1970, 1971 AND 1973), (IN FRENCH),
Bordeaux-3 Univ., Talence (France). Lab. Zoology.
For primary bibliographic entry see Field 5C.
W77-01019

PLANKTON COMMUNITIES OF THR MAZURIAN LAKES AND CHLOROPHY CONTENT IN THEIR PHYTOPLANKTON, POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-K towo (Poland).
For primary bibliographic entry see Field 5C.
W77-01029

NUMBER AND BIOMASS OF OLIGOCHAE OF THE SPECIES POTAMOTHRIX HA MONIENSIS MICH. IN LAKES DUSIA, GA STAS, OBELIJA AND SLAVANTAS IN 19 1971, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst Zoologii i Parazitologii.
For primary bibliographic entry see Field 5C.
W77-01033

THE TIME AND THE CAUSE OF EXTERMIN TION OF LAKE BALLS FROM LAKE ZELL (IN JAPANESE),
Yamagata Univ. (Japan). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01034

STUDIES ON THE BOTTOM FAUNA OF FI LAKES IN SOUTHERN HOKKAIDO (LAK HIKOTSU-KO, KUTTARA-KO, TOYA-K HANGETSU-KO AND OSHIMA O-NUMA, JAPANESE),
Mieken Science Education Center, Yokkai (Japan).
For primary bibliographic entry see Field 5C.
W77-01037

THE PHYSICAL-CHEMICAL CONDITIONS THE WATERS OF THE LAKE OF ORTA DU ING THE PERIOD FROM 1964 TO 1970, ITALIAN),
For primary bibliographic entry see Field 5C.
W77-01038

ANTHROPOGENIC MORPHOGENESIS THE RELIEF OF THE LOWER DON, (IN RU SIAN),
Rostov-on-Don State Univ. (USSR).
P. F. Molodkin.
Izv Sev-Kavk Nauchntsentra Vyssh Shk Este Nauki 3(1), p 94-97, 1975.

Descriptors: Agriculture, *Classification, Res voirs, Ponds, Forest management, Mining, Wa disposal.
Identifiers: *Anthropogenic reli *Morphogenesis, USSR, *Don River(USSR).

Anthropogenic morphogenesis is defined as t totality of processes and phenomena related to t activities of man and society to change t present-day relief of the earth's surface. The reli and contemporary gemorphologic processes in t Lower Don basin were analyzed. Anthropoge relief-forming processes are classified with co sideration of certain types of man's economic a tivities, e.g., agriculture, mining, constructio forest amelioration. For each type of activity t anthropogenic processes (e.g., creation of artific water bodies, formation of waste dumps, gradi of the earth's surface, creation of field-protecti forest plantings) and postanthropogenic process and phenomena (e.g., reworking of shores and bo tom of reservoirs and ponds, subsidence of t surface above mines, formation of anthropoge deposits or cultural layer, decrease of the activi

f deflation and erosion processes and dust orms) are described.--Copyright 1976, Biological bstracts, Inc.
77-01039

ENERAL RECORDS AND NEW IORPHOMETRIC DATA FOR AN ENVIRON-IENTAL STUDY ON LAKE ISEO, (IN TALIAN),
adua Univ. (Italy). Instituto di Botanica e isiologia Vegetale.
. Cordella.
iv Idrobiol 12(2/3), p 97-105, 1973.

escriptors: *Lakes, *Lake morphology, Europe, ata collections, Discharge(Water), Distribution.
lentifiers: *Lake Iseo(Italy).

eographical, morphological and hydrological ata and references on the basic on Lake Iseo are eported. The morphological parameters were rawn from a bathymetric map recently issued by tituto Idrografico della Marina (1967). Informa-on on catchment area and discharge rates are also iven. Hypsographic curves showing the depth-istribution of lake volume and areas are also resented.--Copyright 1976, Biological Abstracts, nc.
77-01041

I. Water In Plants

HE INVASION OF RATE OF FISH EARLINGS WITH PLEROCERCOIDS OF THE ROAD FISH TAPEWORM IN THE KAMA VATER RESERVOIR, (IN RUSSIAN),
ll-Union Scientific Research Inst. of Medical arasitology and Tropical Diseases, Moscow USSR).
. S. Artamoshin.
led Parazitol Parazit Bolezn. 44(1), p 71-74, 1975.

escriptors: Fish, *Perch, Reservoirs, Infection, Fish diseases, *Fish parasites.
lentifiers: Diphyllobothrium-Latum, Kama eservoir, Perca-Fluviatilis, *Plerocercoids, Rus-an-SFSR, *Tapeworm, USSR.

he infection rate with plerocercoids of Diphyl-obothrium latum in 1-yr-old fish, mainly perch Perca fluviatilis), was investigated in the Kama ater reservoir in the Usolsk region of the Perm blast, Russian SFSR, USSR, in 1971-1972. Con-derable differences in the risk of fish infection ere found in various parts of the water reservoir iffering ecologically and by the extent of con-mination with D. latum eggs. The level of fish in-estation depended upon the period of their ex-mination.--Copyright 1975, Biological Abstracts, nc.
77-00541

OLLUTION ECOLOGY OF FRESHWATER IN-ERTEBRATES,
89 p. Academic Press: New York, N. Y., Lon-on, England. 1974. Pr.$24.50. C. W. Hart, Jr., L. . Samuel Fuller, (Eds.).

escriptors: *Invertebrates, *Ecology, Protozoa, Bioindicators, *Methodology, Crustaceans, In-ects, Mollusks, Worms, Snails, Crayfish, An-elids, Clams, Publications.
lentifiers: Bryozoa, *Flatworms, *Pollution cology, Leeches, Sponges.

ach article in this volume deals with 1 of the ajor invertebrate groups. The normal ecology, ecent systematic interpretations and current nowledge on pollution ecology are the major reas of discussion for each invertebrate group. he protozoans, sponges, flatworms, leeches, quatic earthworms, bryozoans, crayfishes, ams, mussels, insects and snails are dealt with. he methodology and limitations of using these in-vertebrates as pollution indicators are discussed. Each paper concludes with a reference list which serves as a source for supplementary background material. Environmentalists, biologists and research workers and students in this field will find this book valuable as a reference source.--Copyright 1975, Biological Abstracts, Inc.
W77-00557

EFFECT OF YEAST AND COBALT CHLORIDE IN INCREASING SURVIVAL RATE OF HATCHLINGS OF HETEROPNEUSTES FOSSILS (BLOCH),
Central Inland Fisheries Research Inst., Jaipur (India). All-India Co-ordinated Research Project.
H. A. Khan, and S. K. Mukhopadhyay.
Indian J Anim Sci. 43(6), p 540-542, 1973.

Descriptors: *Yeasts, *Chlorides, Fish food organisms, Fish hatcheries, Plankton, Mortality.
Identifiers: *Cyclops, *Heteropneustes-Fossilis, *Cobalt chloride.

The survival of hatchlings of H. fossilis (Bloch) is very poor, especially in the 1st 2 wk. This may be because of shortage of choice food, depradation by Cyclops and cannibalism. While feeding the fish with live plankton, an application of yeast (0.05 g/l) and cobalt chloride (1 ppm) in the water enhance the survival rate of the hatchlings up to 80%. The experimental procedure for this is discussed in detail.--Copyright 1975, Biological Abstracts, Inc.
W77-00632

CROWN STRUCTURE AND DISTRIBUTION OF BIOMASS IN A LODGEPOLE PINE STAND,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
USDA For. Serv. Res. Pap. RM-165, (1975), 20 p.

Descriptors: *Biomass, *Canopy, Productivity, Transpiration, Pinus contorta, *Pine trees, *Trees, Foliar, *Plant growth.

Gross dimensions and quantities of needles and branches are presented for 298 trees. Weight, diameter, length, and height relations were usually highly correlated. Needles were normally distributed along the length of branches as well as vertically through the canopy. Needle and branchwood weights for entire crowns were best estimated by the logarithmic transformation of diameters at breast height. (Forest Service)
W77-00729

CHARACTERISTICS OF THE MAIN COMPONENTS OF WATER BALANCE OF SANDY DESERT PLANT COMMUNITIES, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Biogeography.
V. P. Dedkov, P. D. Gunin, and M. Ishankuliev.
Probl Osvoeniya Pustyn 2, p 21-27, 1975.

Descriptors: *Water balance, *Desert plants, Sands, Vegetation, Distribution, Rainfall, Moisture content.
Identifiers: Ammodendron-conollyi, Calligonum-arborencens, Carex-physodes, Haloxylon-ammodendron, Haloxylon-persicum, Kara-kum, *Turkmen-SSR(USSR).

Data are presented on the effect that tree and shrub vegetation has on the redistribution of rainfall, dynamics of field moisture and plant water discharge. Comparison of the total reserve, water discharge 2 m deep and plant water discharge shows that the water balance in the association of Ammodendron conollyi - Calligonum arborescens in barkhan sands is positive, in the Haloxylon ammodendron - Carex physodes association in valley-like depressions it is negative and in H. persicum-C. physodes it is balances (Turkmen SSR, USSR).--Copyright 1976, Biological Abstracts, Inc.
W77-00882

THE HEAT BALANCE IN THE FOREST-STEPPE MESOPHILIC DECIDUOUS HIGH OAK FOREST 'LES NA VORSKLE' UNDER ABNORMAL WEATHER CONDITIONS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
A. I. Karausheva.
Vestn Leningr Univ Biol 2, p 68-76, 1975.

Descriptors: *Heat balance, *Oak trees, *Forest management, Humidity, Deciduous trees, Weather.
Identifiers: Acer-campestre, Acer-platanoides, Fraxinus-excelsior, Quercus-robur, Steppe, Tiliacordata, *USSR, Vorskle.

Heat balance in the oakwood (USSR) was investigated under extreme weather conditions in the dry, hot, cloudless summer of 1972 and in the cloudy, wet summer with heavy rains in 1973. The vertical humidity, heat exchange and temperature profile were analyzed in biohorizons in the tree crowns (Quercus robur, Tilia cordata, Acer campestre, A. platanoides, Fraxinus excelsior) and under them. Characteristics of the investigated plot and methods of observation and calculation are discussed.--Copyright 1976, Biological Abstracts, Inc.
W77-00964

2J. Erosion and Sedimentation

URBAN SEDIMENT PROBLEMS: A STATEMENT ON SCOPE, RESEARCH, LEGISLATION, AND EDUCATION.
American Society of Civil Engineers, New York. Task Committee on Urban Sedimentation Problems.
For primary bibliographic entry see Field 5B.
W77-00556

ALIPHATIC HYDROCARBONS IN SEDIMENTS OF LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-00643

HYDROCHEMISTRY OF THE PARANA RIVER,
Instituto Nacional de Limnologia, Santo Tomo (Argentina).
For primary bibliographic entry see Field 2K.
W77-00644

STRATIFIED WATERS AS A KEY TO THE PAST,
Hamburg Univ. (West Germany). Geologisch-Palaontologisches Institut.
E. T. Degens, and P. Stoffers.
Nature, Vol. 263, No. 5572, p 22-27, September 2, 1976. 6 fig, 34 ref.

Descriptors: *Stratification, *Sediments, *Lakes, *Oceans, Thermal stratification, Facies(Sedimentary), Geologic time, *Geologic history, Paleolimnology, Paleoclimatology, *Density stratification, Chemicals, Oxygen, Diatoms, Sedimentology, *Lake sediments.

Density stratification in lakes and oceans generate anoxic conditions below the pycnocline, and sediment facies mirror this development. A comparison of modern sediments deposited in stratified and non-stratified waters with sediments formed since the Cambrian revealed that the ancient sea has been stratified a number of times. (Sims-ISWS)
W77-00659

SEDIMENT CHARACTERISTICS AND THE TROPHIC STATUS OF FOUR OREGON LAKES,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W77-00673

INTEGRAL-EQUATION ANALYSIS OF FLOWS OVER ERODING BEDS,
Mississippi Univ., University. Dept. of Civil Engineering.
S. N. Prasad, and C. V. Alonso.
In: Proceedings, ASCE Symposium on Inland Waterways for Navigation, Flood Control and Water Diversions, Aug. 10-12, 1976, Colorado State University, Fort Collins, CO, Vol. I, p 760-772, 5 fig, 7 ref.

Descriptors: *Stream erosion, *Bank erosion, *Sediment transport, *Tractive forces, Fluid mechanics, Hydraulics, Natural streams, Steady flow, Uniform flow, Viscous flow, Analytical techniques, Open channel flow.
Identifiers: *Fredholm integral equation, Rectangular channels.

The steady uniform flow in alluvial channel of rectangular cross section with a partially eroding bed is considered. The wetted perimeter is divided into an inner region in which the known critical tractive forces are exceeded, surrounded by a region where the fluid velocity is known to vanish. The free surface is free from shear. This mixed boundary value problem is formulated in terms of a dual series which leads to the solution of a Fredholm integral equation of the second kind. This solution determines the extent of the eroding zone and the distribution of the bed-slip velocity. Particular solutions that include the distribution of isotachs and boundary unit tractive forces are presented for the case of incipient erosion at the bed center, and for the case of a fully eroding bed. Numerical results of the quantities of practical interest are reported. (ARS)
W77-00682

THE SEDIMENTS OF LAKE GEORGE (UGANDA). I: REDOX POTENTIALS, OXYGEN CONSUMPTION AND CARBON DIOXIDE OUTPUT,
Malaya Univ., Kuala Lumpur (Malaysia). School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-00712

THE ROLE OF SEDIMENT AS A MODIFYING FACTOR IN PESTICIDE-ALGAE INTERACTIONS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-00713

SUBMERGED BURLAP STRIPS AIDED REHABILITATION OF DISTURBED SEMIARID SITES IN COLORADO AND NEW MEXICO,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-00727

MOUNTAIN WATERSHEDS AND DYNAMIC EQUILIBRIUM,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-00728

PROCEEDINGS OF THE THIRD FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE 1976.
Water Resources Council, Washington, D.C. Sedimentation Committee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 100, Price codes: A99 in paper copy, A01 in microfiche.
Report SEDCOM-03, Preprints for a conference held March 22-25, 1976, Denver, Colorado. Sedimentation Committee of the Water Resource Council, Washington, D.C., December 1975. 974 p.

Descriptors: *Sedimentation, *Sediment transport, *Erosion, *Surface runoff, *Conferences, Sediment control, Erosion control, Sediments, Deposition(Sediments), Suspended solids, Rivers, Streams, Coasts, Estuaries, Watersheds(Basins), Forests, Channel improvement, Urban runoff, Physical properties, Chemical properties, Instrumentation, Equipment, Sedimentology.

In the 13 years since the last conference, there has been a large amount of research and development work. The work group recommended that a third conference be held in March 1976. Of the 130 workers in sedimentation who indicated a willingness to prepare and present papers at this Third Federal Inter-Agency Conference on Sedimentation, the committee accepted about 80 papers for publication in the proceedings. The broad topics covered were the following: Sediment yield and sources; Erosion and sediment control; Physical and chemical properties of sediment; Sediment transport and deposition; Channel adjustments; Coastal zone sedimentation; and Instrumentation. (See W77-00776 thru W77-00845) (Sims-ISWS)
W77-00775

EROSION POTENTIAL OF SOILS,
Soil Conservation Service, Washington, D.C. Soil Survey Interpretations Div.
K. K. Young.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-1 - 1-10, 1976. 12 ref.

Descriptors: *Erosion, *Soil erosion, *Farm management, *Urbanization, Farms, Cities, Environment, Land use, Soils, Soil surveys, Soil texture, Organic matter, Soil structure, Soil conservation, Permeability, Crops, Structures.
Identifiers: *Erosion potential, Soil loss equation, Soil erodibility factor.

Erosion and sediment from farmland remains a serious problem in the United States. Gaining national concern is the erosion and sediment resulting from urban development. Predicting the erosion potential of soils is one of the first steps used by the Soil Conservation Service in planning conservation systems that control soil erosion on farmland and urban developments alike. This paper described the application of research to produce a practical field procedure for determining the erosion potential of soils. Special emphasis was given to the soil factors that influence erosion and to how soil surveys are used to predict the areas of potential erosion. (See also W77-00775) (Sims-ISWS)
W77-00776

EFFECT OF LAND USE ON SEDIMENT DELIVERY RATIOS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
C. K. Mutchler, and A. J. Bowie.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-11 - 1-21, 1976. 4 fig, 2 tab, 8 ref.

Descriptors: *Erosion, *Land use, *Sediment
*Mississippi, Gullies, Gully erosio
Watersheds(Basins), Rainfall, Runof
Geomorphology, Soils, Mathematical studies, Sc
erosion, Sediment yield, Sheet erosion, Drainag
area, Crops, Farm management, Structures.
Identifiers: Erosion potential.

Data from two subwatersheds in the Pigeon Roo
Creek Watershed in northern Mississippi we
used to compute sediment delivery ratios for ea
year of a 15-year period. Land use chang
resulted in greatly decreasing land and gully er
sion estimates in one watershed and slightly i
creasing estimates for the other. Computed annu
sediment delivery ratios did not seem to chan
due to changing land use on either watershe
However, annual values of delivery ratios chang
directly with annual runoff. The major effect
gully plugs and other conservation structures
sediment production was to negate the effect of
and 34% of the total estimated sheet and gully er
sion on the two watersheds. (See also W77-0077
(Sims-ISWS)
W77-00777

WATERSHED EROSION MODEL VALIDATIO FOR SOUTHWEST IOWA,
Agricultural Research Service, Morris, Min
North Central Soil Conservation Research Cente
For primary bibliographic entry see Field 4D.
W77-00778

RESERVOIR SEDIMENTATION ASSOCIATI WITH CATCHMENT ATTRIBUTES, LAN SLIDE POTENTIAL, GEOLOGIC FAULT, AN SOIL CHARACTERISTICS,
Forest Service (USDA), Berkeley, Calif. Paci
Southwest Forest and Range Experiment Statio
H. W. Anderson.
In: Proceedings of the Third Federal Inter-Agen
Sedimentation Conference, 1976; Denv
Colorado, March 22-25, 1976. Water Resourc
Council, Washington, D.C., Sedimentation Co
mittee, p 1-35 - 1-46, 1976. 1 tab, 19 ref.

Descriptors: *Reservoirs, *Sedimentatio
*Regression analysis, *Californ
Watersheds(Basins), Erosion, Precipi
tion(Atmospheric), Rainfall, Forests, Forest fir
Roads, Geology, Faults(Geologic), Soils, Strea
flow, Landslides, Topography, Sedimentology.

Deposition measurements in 48 northern Calif
nia reservoirs were found related to precipitati
amount, rain-snow frequency, road standards a
location, forest fires, geology, and physiograph
and also to differences among watershe
(catchments) in landslide classes, extent of geol
ic faults, clay content of watershed soils, and d
sity of reservoir sedimentation. The data w
analyzed by reduced rank principal compone
techniques. The final regression equation had
explained variance of 0.86 and a standard error
0.138 log units. Difference in average ann
deposition associated with reservoir density w
39%; with landslides, 100%; with faults, 41%; a
with clay in watershed soils, 32%. Some geolo
rock types with geologic faults and high landsli
potential had a predicted sediment rate as much
17 times that of areas without faults. Ro
located near streams contributed the most
deposition– twice as much as did roads located
sewhere, and improved secondary roads n
streams were the single greatest contributor, es
cially in areas of steep terrain. Roads in st
topography produced twice as much accelerati
in sedimentation as did those in less steep terra
Preliminary appraisal of bedload (differen
between reservoir deposition and suspended se
ment discharge) indicated that it varies from 9
to less than 20% of 'total load' in different are
(See also W77-00775) (Sims-ISWS)
W77-00779

EDIMENT YIELD FROM CONSTRUCTION
TES,
ITRE Corp., McLean, Va. Dept. of Environ-
ental Assessment.
or primary bibliographic entry see Field 4C.
77-00780

EDIMENT SOURCES AND YIELDS FROM
AGEBRUSH RANGELAND WATERSHEDS,
gricultural Research Service, Boise, Idaho.
orthwest Watershed Research Center.
or primary bibliographic entry see Field 4D.
77-00781

ROSION AND SEDIMENT YIELD IN NEW
EXICO,
il Conservation Service, Portland, Oreg. En-
neering and Watershed Planning Unit.
M. Curtis, Jr.
: Proceedings of the Third Federal Inter-Agency
dimentation Conference, 1976; Denver,
lorado, March 22-25, 1976. Water Resources
uncil, Washington, D.C., Sedimentation Com-
tee, p 1-81 - 1-90, 1976. 4 fig, 6 tab, 7 ref.

escriptors: *Erosion, *Sediment yield, *New
exico, Land use, Ranges, Forests, Crops, Cities,
infall, Runoff, Precipitation(Atmospheric),
diments, Sedimentation, Soil erosion,
atersheds(Basins), Rivers, Vegetation, Gullies,
dimentology, Sheet erosion.

nnual erosion in New Mexico was estimated to
between 50 and 119 million cubic meters (40,900
d 96,500 acre-feet). An estimated 74% of the
osion occurred on rangeland with lesser percent-
es on forest, urban, and crop land. It was found
at erosion in localized areas can be more than
,242 cubic meters per square kilometer per year
2 acre-feet per square mile per year). It was also
arned that average annual sediment yield to
servoirs may be more than 4,334 cubic meters
r square kilometer per year (9.1 acre-feet per
uare mile per year). Suspended sediment con-
ntrations have been as high as 267,000 milli-
ams per liter in the Rio Pureco. (See also W77-
775) (Sims-ISWS)
77-00782

EBRIS FLOWS FOLLOWING WILDFIRE IN
ORTH CENTRAL WASHINGTON,
orest Service (USDA), Wenatchee, Wash.
cific Northwest Forest and Range Experiment
ation.
or primary bibliographic entry see Field 4C.
77-00783

EDIMENT YIELDS FROM A MISSISSIPPI
ELTA WATERSHED,
gricultural Research Service, Oxford, Miss.
dimentation Lab.
or primary bibliographic entry see Field 4D.
77-00784

EDIMENTATION IN BIRCH LAKE, IOWA
OUNTY, WISCONSIN,
il Conservation Service, Madison, Wis.
N. Cheetham, Jr., and R. F. Wilke.
: Proceedings of the Third Federal Inter-Agency
dimentation Conference, 1976; Denver,
olorado, March 22-25, 1976. Water Resources
ouncil, Washington, D.C., Sedimentation Com-
ttee, p 1-110 - 1-122, 1976. 3 fig, 3 tab, 11 ref.

escriptors: *Sedimentation rates, *Lake sedi-
ents, *Reservoirs, *Wisconsin, Surveys, Sam-
ng, Chemical properties, Physical properties,
diments, Bottom sediments, Sedimentation,
orage capacity, Land use, Soils, Geology,
ainage, Sediment yield, Erosion, Soil erosion,
dimentology.
entifiers: *Birch Lake(Wis), *Trout Creek(Wis),
wa County(Wis).

During March 1975, a reservoir sediment survey was made at Birch Lake, Iowa County, Wisconsin. Twenty-three bottom sediment samples were collected through the ice along eight ranges in the lake. Two ranges were augered on the flood plain of Trout Creek above the impoundment. The samples were first described in the field, and then selected portions of core profiles were analyzed for physical and chemical properties. The volume and density of a 10.5-year accumulation of sediment in the reservoir were determined. The sediment survey indicated an average annual sediment yield in 10.5 years of 3.45 metric tons/ha (1.54 tons/acre) as compared with a predicted average annual yield of 1.88 metric tons/ha (0.84 tons/acre) in 1960 prior to dam construction and 1.59 metric tons/ha (0.71 tons/acre) in 1974. The watershed was predominantly cropland and pasture. Land use and land treatment were compared prior to dam construction and in 1974. Comparisons were made between predicted watershed sediment yield and the measured sediment in the reservoir. This study is a basis for future land use, land treatment, and sediment surveys at 5-year intervals. (See also W77-00775) (Sims-ISWS)
W77-00785

SEDIMENT YIELD FROM STEEP LANDS IN THE DRIFTLESS AREA,
North Central Forest Experiment Station, La Crosse, Wis. Watershed Lab.
R. S. Sartz.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-123 - 1-131, 1976. 4 fig, 4 tab, 8 ref.

Descriptors: *Sediment yield, *Suspended solids, *Erosion, *Wisconsin, Forests, Cultivated lands, Pastures, Grazing, Surveys, Sampling, Data processing, Watersheds(Basins), Storms, Runoff, Storm runoff, Gullies, Soil erosion, Sediments, Sediment discharge.

Data from four years of experimentation were summarized: Suspended sediment in runoff water was measured on natural runoff plots and small watersheds in different land uses on southwestern Wisconsin's ridge and valley lands. Substantial amounts of sediment were discharged only from cultivated or heavily grazed catchments. The greatest amounts--sometimes exceeding 200,000 ppm--came from tilled cropland in early stages of crop development. Values varied greatly from one catchment to another, probably because of differences in erosion patterns that developed under tillage and because of differences in cover density. Some additional observations were made on sediment movement: Ungrazed forest and prairie in the Driftless Area yield no significant amounts of runoff or sediment, regardless of slope steepness, unless they intercept water from overlying fields. However, field runoff can carve huge gullies on forested slopes that lie below cultivated uplands. Thus, the forested slopes of the area have been a major sediment source from gully erosion since the time of agricultural settlement. (See also W77-00775) (Sims-ISWS)
W77-00786

EROSION AND SEDIMENT FROM FOREST LAND USES, MANAGEMENT PRACTICES AND DISTURBANCES IN THE SOUTHEASTERN UNITED STATES,
Forest Service (USDA), Atlanta, Ga. Southeastern Area.
For primary bibliographic entry see Field 4C.
W77-00787

SIMULATING EROSION DYNAMICS WITH A DETERMINISTIC DISTRIBUTED WATERSHED MODEL,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 4D.
W77-00788

SEDIMENTATION OF A FLATLAND WATERSHED IN LOUISIANA,
Soil Conservation Service, Alexandria, La. Watershed Planning and River Basin Studies.
For primary bibliographic entry see Field 4D.
W77-00789

WATER AND SEDIMENT ROUTING FROM SMALL WATERSHEDS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-00790

SOURCES AND SEDIMENT YIELD OF HAWAIIAN WATERSHED AND COASTAL SEDIMENTS,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics; and Hawaii Inst. of Geophysics.
P-F. Fan.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-219 - 1-231, 1976. 6 fig, 11 ref. OWRT A-043-HI(4).

Descriptors: *Sediment yield, *Watersheds(Basins), *Hawaii, *Mineralogy, Surveys, Sampling, Runoff, Rainfall, Sediments, Clays, Silts, Sands, Soils, Erosion, Geology, Vegetation, Slopes, Clay minerals, Coasts, Estuaries.

The mineral composition, as well as the texture of Hawaiian watershed and coastal sediments, are dependent on various parameters. Geology, climatology, vegetation, stream slope and channel morphology, bathymetry, and cultural activities, are all important. Hawaiian streams enter the ocean basin through one of the following kinds of environment: estuaries, bays, lagoons, or mouths of tidal streams. The coastal environments serve as temporary sinks for tidal streams. The coastal environments serve as temporary sinks for the sediments. Four representative watershed coastal environments from Oahu were selected for detailed study. They were Kahana, Kaneohe, Hawaii Kai, and Pearl Harbor. Kahana stream had the lowest sediment yield, compared with the stream in the urbanizing area. Kipapa Stream (Pearl Harbor Basin) had the highest sediment yield. (See also W77-00775) (Sims-ISWS)
W77-00791

THE HYDROLOGIC AND SEDIMENT PROCESSES IN NATURAL WATERSHED AREAS,
Hydrocomp International, Palo Alto, Calif.; and Hydrocomp International, Glasgow (Scotland).
For primary bibliographic entry see Field 4D.
W77-00792

SOIL EROSION CONCEPTS AND MISCONCEPTIONS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
L. D. Meyer, D. G. DeCoursey, and M. J. M. Romkens.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation committee, p 2-1 - 2-12, 1976. 2 fig, 1 tab, 29 ref.

Descriptors: *Soil erosion, *Sedimentation, *Erosion, Sheet erosion, Rill erosion, Sediments, Sediment transport, Rainfall, Runoff, Erosion control, Forecasting, Soils, Topography, Slopes, Sediment discharge, Sediment yield, Model studies, Mathematical models, On-site investigations.
Identifiers: *Erosion processes, Interrill erosion.

The complementary processes of soil erosion and sedimentation involve a complex interrelationship of many factors that influence detachment, transportation, and deposition of soil particles. Recent research has provided knowledge useful for developing improved concepts concerning these processes and for allaying certain misconceptions about them. In this paper, current concepts of the process of soil erosion by water were presented. Their implications as a basis for continued improvements in erosion prediction and control were discussed. Research deficiencies were indicated, and promising new approaches were explored. (See also W77-00775) (Sims-ISWS)
W77-00793

COMPARATIVE COSTS OF EROSION AND SEDIMENTATION CONTROL MEASURES,
Irrigation/Agriculture Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W77-00794

SOIL RIPPING TREATMENTS FOR RUNOFF AND EROSION CONTROL,
Forest Service (USDA), Albuquerque, N. M. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-00795

SOIL AND WATER LOSS FROM IMPOUNDMENT TERRACE SYSTEMS,
Agricultural Research Service, Ames, Iowa.
For primary bibliographic entry see Field 4D.
W77-00796

EXCAVATED SEDIMENT TRAPS PROVE SUPERIOR TO DAMMED ONES,
Forest Service (USDA), Rolla, Mo. National Forests in Missouri.
For primary bibliographic entry see Field 4D.
W77-00797

EROSION AND SEDIMENT CONTROL ON RESHAPED LAND,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 4D.
W77-00798

DEFINING THE SEDIMENT TRAPPING CHARACTERISTICS OF A VEGETATIVE BUFFER. SPECIAL CASE: ROAD EROSION,
Forest Service, Denver, Colo. Rocky Mountain Region.
For primary bibliographic entry see Field 4D.
W77-00799

GEOTECHNICAL MANAGEMENT OF FOREST LANDS IN GRANITIC TERRANE,
Forest Service (USDA), Medford, Oreg. Rogue River National Forest.
For primary bibliographic entry see Field 4C.
W77-00800

EVALUATION OF AN EXTENSIVE SEDIMENT CONTROL EFFORT IN THE LOS ANGELES RIVER BASIN,
Forest Service (USDA), Turlock, Calif. Stanislaus National Forest.
For primary bibliographic entry see Field 4D.
W77-00801

SEDIMENT CONTROL AT IMPERIAL DAM,
Bureau of Reclamation, Yuma, Ariz. Yuma Projects Office.
For primary bibliographic entry see Field 4D.
W77-00802

DETERMINING EROSION FROM HAWAIIAN AGRICULTURAL LANDS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 4D.
W77-00803

THE UNIVERSAL SOIL LOSS EQUATION AS ADAPTED TO THE PACIFIC NORTHWEST,
Washington State Univ., Pullman. Agricultural Research Center.
D. K. McCool, R. I. Papendick, and F. L. Brooks.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 2-135 - 2-147, 1976. 4 fig, 1 tab, 15 ref.

Descriptors: *Soil erosion, *Pacific Northwest U. S., *Agricultural runoff, Equations, Regression analysis, Temperature, Topography, Soils, Slopes, Crops, Adaptation, Farm management, Erosion, Sediments, Rainfall, Runoff.
Identifiers: Universal Soil Loss Equation.

Use of the Universal Soil Loss Equation for soil loss prediction in the Pacific Northwest has been limited by inapplicable relationships for the factors of the equation. A first-generation adaptation of the equation was made by developing new relationships to fit Pacific Northwest conditions. These included (1) a slope length-steepness relationship to account for steeper slopes (greater than 20%) and runoff-induced erosion; (2) a runoff-rainfall erosion factor that accounts for effects on soil loss of climatic phenomena peculiar to the region, i.e., low intensity rainfall, snowmelt, and rain or snowmelt on frozen ground; and (3) first-approximation crop management factors to fit the region. The Soil Conservation Service is field testing the adaptation. (See also W77-00775) (Sims-ISWS)
W77-00804

TECHNIQUES OF RESEARCHING INFORMATION FOR THE DEVELOPMENT OF A MANUAL TO VEGETATE SOILS OF LOW PRODUCTIVITY DISTURBED BY CONSTRUCTION ACTIVITIES,
Midwest Research Inst. Kansas City, Mo.
For primary bibliographic entry see Field 4D.
W77-00805

THE DILEMMAS OF SETTING SEDIMENT STANDARDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-00806

DESIGN AND PERFORMANCE OF ROCK REVETMENT TOES,
Army Engineer District, Kansas City, Mo. Hydrologic Engineering Branch.
For primary bibliographic entry see Field 8D.
W77-00807

CONTROL OF TURBIDITY AT CONSTRUCTION SITES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 4D.
W77-00808

SUSPENDED SEDIMENT, SOLAR RADIATION AND HEAT IN AGRICULTURAL RESERVOIRS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
F. R. Schiebe, J. C. Ritchie, and J. R. McHenry.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 3-1 - 3-12, 1976. 5 fig, 2 tab, 4 ref.

Descriptors: *Sediments, *Solar radiation, *Water temperature, *Reservoirs, *Mississippi, Heat budget, Energy budget, Temperature, Reflectance, Heat transfer, Lakes, Equations, Secchi disks, Suspended solids, Albedo, Air-water interfaces, Radiation, Meteorology.

Comparative studies conducted on two adjacent northern Mississippi reservoirs showed that the suspended sediment has a measurable effect on the surface water temperature. Spectroradiometer measurements of reflected solar radiation from waters with different concentrations of suspended sediment indicated that up to 4 times as much energy is reflected from a reservoir with 200-ppm sediment concentrations than is radiated from an adjacent reservoir with 50-ppm concentrations. Epilimnion temperature measurements indicated a 1 to 4 C difference with clearer waters always warmer. Energy budget equations consistent with the experimental findings showed that if turbid waters reflect more energy, then the temperature of these surface waters is cooler than that of clear water. (See also W77-00775) (Sims-ISWS)
W77-00809

NUTRIENTS LOST IN DEBRIS AND RUNOFF WATER FROM A BURNED CHAPARRAL WATERSHED,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W77-00810

PHYSICAL AND CHEMICAL CHARACTERISTICS OF SEDIMENTS ORIGINATING FROM MISSOURI VALLEY LOESS,
Agricultural Research Service, Cheyenne, Wyo. North Central Region.
For primary bibliographic entry see Field 5B.
W77-00811

SEDIMENT-PHOSPHORUS RELATIONS IN SURFACE RUNOFF FROM IRRIGATED LANDS,
Agricultural Research Service, Kimberly, Idaho Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 5B.
W77-00812

PESTICIDE CONCENTRATIONS AND YIELDS IN RUNOFF AND SEDIMENT FROM A MISSISSIPPI DELTA WATERSHED,
Agricultural Research Service, Baton Rouge, La.
For primary bibliographic entry see Field 5B.
W77-00813

EFFECT OF AN ARTIFICIALLY INCREASED SAND BEDLOAD ON STREAM MORPHOLOGY AND ITS IMPLICATIONS ON FISH HABITAT,
North Central Forest Experiment Station, Rhinelander, Wis. Inst. of Forest Genetics.
E. A. Hansen, and G. R. Alexander.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 3-65 - 3-76, 1976. 6 fig, 3 tab, 3 ref.

Descriptors: *Sands, *Bed load, *Sediments, *Michigan, *Habitats, Fish, *Trout, Brook trout, Fish populations, Habitat improvement, Scour, Channel morphology, Streams, Water temperature, Depth, Sand waves, Streambeds, Water pollution effects.
Identifiers: Added sands, Increased sand bedloads.

Sand sediment was added daily for nearly four years to a low gradient Michigan trout stream to

mine effects on stream morphology, water erature, and, ultimately, the trout population. sand input was adjusted so that the average ent concentration was increased by a factor ur over the pretreatment concentration of 20 . Sediment discharge was measured just up- m of the sand input point, and also at the r end of the treated section, 1.6 km (1 mile) stream. Permanent stream cross-section sta- were spaced at 30-m (100 ft) intervals along .6 km (1 mile) control and treated sections to tate the measurement of channel changes. rout population was inventoried twice a year termine its response to the increased sand ad. The added sand with its resultant mbed aggradation produced increases in m gradient and width, and decreases in m depth and in the total static volume of r. The stream gradient and channel form were uniform throughout the treated reach due to filling. Streambed composition changed sub- ially; gravel areas decreased, sand areas in- ed. Water temperatures were slightly warmer mmer cooler in winter due, presumably, to vider, shallower stream. The impact of these ges on the trout population will be reported at r date to allow time for population responses, y, to occur. (See also W77-00775) (Sims- S)
00814

E OF THE SEDIMENTATION IN THE -PURIFICATION OF THE SCHELDT UARY,
oratoire de Recherches Hydrauliques, Ant- (Belgium).
rimary bibliographic entry see Field 5B.
00815

DEL STUDY OF THE DRAG COEFFICIENT STREAMBED PARTICLE,
cultural Research Service, Oxford, Miss. nentation Lab.
Coleman, and W. M. Ellis.
roceedings of the Third Federal Inter-Agency nentation Conference, 1976; Denver, rado, March 22-25, 1976. Water Resources cil, Washington, D.C., Sedimentation Com- e, p 4-1 - 4-11, 1976. 5 fig, 9 ref.

riptors: *Model studies, *Streambeds, iment transport, *Hydraulic models, Mathe- al models, Laboratory tests, Flow, Drag, olds number, Loads(Forces), Sands, Equa- , Silts, Sediments, Sedimentation.
ifiers: *Time-mean drag coefficient.

ie-mean drag coefficient for a streambed par- was derived from considerations of flow- rated force moments and particle packing etry. The drag coefficient was taken as a ion of a particle Reynolds number and a ity profile steepness parameter. These neters were shown to be in fixed relation to other because of the nature of the bounded flow near a streambed. The relation between two parameters and the correlation of the coefficient with the relation between them lemonstrated in experiments. (See also W77-) (Sims-ISWS)
00816

MENT TRANSPORT CHARACTERISTICS HE UPPER SAN FRANCISCO BAY-DELTA UARY,
au of Reclamation, Sacramento, Calif. Mid- ic Regional Office .
rimary bibliographic entry see Field 2L.
00817

TAL SIMULATION OF AGGRADATION DEGRADATION IN NATURAL STREAMS,
South Wales Univ., Kensington (Australia). lty of Military Studies.
Amar, and W. A. Thomas.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 4-26 - 4-36, 1976. 5 fig, 4 ref.

Descriptors: *Scour, *Deposition(Sediments), *Model studies, Degradation(Stream), Aggradation, Sediment transport, Sediments, Streams, Rivers, Floodways, Levees, Mathematical models, Computer models, Channel morphology, Erosion, Sedimentation, Sedimentology, *Louisiana.
Identifiers: *Atchafalaya Floodway(La).

The analysis of scour and deposition by modeling the interaction between the water-sediment mixture, sediment material forming the stream's boundary, and the hydraulic characteristics of flow was presented using the Hydrologic Engineering Center's computer program entitled 'Scour and Deposition in Rivers and Reservoirs.' This simulation program was particularly useful for analyzing the impact of changes in energy gradient, channel width, inflowing sediment load, or bed material grain size on future trends in channel aggradation or degradation. The results of the analysis were useful for estimating the impact of aggradation on the design profile for levees and the amount, frequency, and location of maintenance dredging, as well as the effect of alternative measures, for maintaining a channel. Example applications illustrated the model calibration and demonstrated its applicability and usefulness for a wide range of hydraulic and sediment conditions. (See also W77-00775) (Sims-ISWS)
W77-00818

LAKE POWELL SEDIMENTATION SURVEYS,
Bureau of Reclamation, Salt Lake City, Utah. Div. of Planning.
J. F. Lazenby, and L. Nelson.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 4-52 - 4-63, 1976. 5 fig, 2 ref.

Descriptors: *Sedimentation, *Reservoirs, *Surveys, *Colorado River, Sedimentation rates, Deposition(Sediments), Reservoir silting, Sediments, Sediment distribution, Lakes, Dams, Rivers, Geomorphology, Deltas, Sedimentology.
Identifiers: *Lake Powell(Ariz-Utah), *Glen Canyon Dam.

Glen Canyon Dam, major unit of the Colorado River Storage Project, is located on the Colorado River near the Arizona-Utah border. Storage in the 27,000,000 acre-foot reservoir began in 1963. Preconstruction studies indicated that sediment would accumulate at an average rate of 85,400 acre-feet per year over a 100 year period. In 1968, 1970, and 1973 the Bureau of Reclamation conducted limited, reconnaissance grade surveys in the delta areas of the reservoir in order to monitor the sediment build-up and its relationship to recreational uses on the lake. Deltas in the two major tributary arms of the reservoir were found to be developing approximately as expected, with their configuration, at this early stage in the reservoir's life, strongly influenced by the original channel topography and the rising water surface. Relatively large delta build-ups have been noted in some of the smaller tributary canyons. Experience and data gained during these limited surveys will be put to use in laying out a monumented sediment range network when the time comes for the first complete volumetric survey of the reservoir. Baseline data for the volumetric survey will come from existing large scale, small contour interval topographic maps of the reservoir basin. (See also W77-00775) (Sims-ISWS)
W77-00819

SEDIMENT PROBLEMS IN THE MOHAVE VALLEY - A CASE HISTORY,
Bureau of Reclamation, Boulder City, Nev. Region 3; and Bureau of Reclamation, Boulder City, Nev. River Development Branch.
For primary bibliographic entry see Field 4D.
W77-00820

ON SEDIMENT TRANSPORT THROUGH THE GRAND CANYON,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
E. M. Laursen, S. Ince, and J. Pollack.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 4-76 - 4-87, 1976. 4 fig, 5 tab, 2 ref.

Descriptors: *Sediment transport, *Colorado River, *Beaches, *Sand bars, Sediment load, Particle size, Degradation, Erosion, Deposition(Sediments), Sands, Beach erosion, Eddies, Banks, Bank erosion, Sediments, Sedimentation, Sedimentology, Arizona.
Identifiers: *Grand Canyon, *Glen Canyon Dam.

With the closure of the Colorado River by Glen Canyon Dam, both the amount and the nature of the sediment movement through the Grand Canyon have changed. At present, the mean annual capacity of the river to carry beach-building material is about 12 million metric tons per year. The tributaries supply about 2.7 metric tons of beach-building sediment per year. The difference of about 9 million metric tons per year must be obtained through scour of bed and/or banks. It is estimated that without remedial measures it may take somewhat more than 200 years before the beaches and sand bars between Glen Canyon Dam and Lake Mead disappear. (See also W77-00775) (Sims-ISWS)
W77-00821

SEDIMENT TRANSPORT STUDIES IN THE DELTA-MENDOTA CANAL AND THE CALIFORNIA AQUEDUCT,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
For primary bibliographic entry see Field 2L.
W77-00822

THE SEDIMENTARY INFLUENCE OF A TRIBUTARY STREAM GROWTH OF THE NIOBRARA DELTA,
Army Engineer District, Omaha, Nebr.
R. H. Livesey.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 4-127 - 4-137, 1976. 5 fig, 5 tab.

Descriptors: *Deltas, *Sedimentation, *Rivers, *Missouri River, Deposition(Sediments), Channels, Channel morphology, Braiding, Flow, Streamflow, Flow control, Sand bars, Sediment yield, Sediment load, Sediment discharge, Sedimentology.
Identifiers: *Niobrara River(Neb).

There is evidence that a dynamic balance has been achieved between the sediment transport capabilities of two alluvial streams when graded conditions develop at their confluence. This quasi-equilibrium state implies a dual adjustability in the channel dimensions or slope of both streams as the individual hydrologic trends of the separate drainages vary discharges and sediment loads. When a sudden reduction in the frequency, magnitude, and duration of flows on the main stem occurs due to upstream regulation, this balance is interrupted and the tributary sediment contribution assumes controlling proportions. Such was the case at the mouth of the Niobrary River after the

Missouri River reservoir system commenced operation in 1953. This paper discussed the growth of the Niobrara delta in the Missouri River channel over a 20-year period. Preliminary results of study investigations were summarized and prevailing trends identified. (See also W77-00775) (Sims-ISWS)
W77-00824

DISTRIBUTION OF RESERVOIR SEDIMENT--IOWA AND MISSOURI DEEP LOESS HILLS,
Agricultural Research Service, Columbia, Mo. North Central Watershed Research Center.
H. G. Heinemann, and D. L. Rausch.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 4-138 - 4-148, 1976. 2 fig, 1 tab, 12 ref.

Descriptors: *Sediment distribution, *Reservoirs, *Iowa, *Missouri, Sedimentation, Storage capacity, Depth, Precipitation(Atmospheric), Runoff, Erosion, Equations, Spillways, Sediments, Loess, Soil erosion, Regression analysis, Sedimentology.

Sedimentation data from 58 surveys of 41 reservoirs were analyzed to determine sediment distribution of deposited sediment. All reservoirs, except two, were located in the Iowa and Missouri Deep Loess Hills Major Land Resource Area. The sedimentation information curves approach was used in this study. Linear and nonlinear regression analyses were used to develop prediction equations for various values of the capacity replaced by sediment curve. It was learned that the minimum design spillway elevation can be predicted if the following are known: (1) total capacity to be replaced by sediment at the end of the reservoir design life, (2) reservoir original 'N' value, (3) length, and (4) original depth. The percentage of the remaining capacity that lies below the principal spillway is dependent upon: (1) the remaining depth ratio, (2) the original 'N' value, and (3) the percentage of the total original capacity that was below the principal spillway. By having the capacity replaced by sediment curve and the original stage-capacity curve, points can be computed for drawing the sediment distribution curve. The capacity replaced by sediment curve and its corresponding sediment distribution curve can be predicted for any estimated reservoir storage depletion in the Iowa and Missouri Deep Loess Hills. (See also W77-00775) (Sims-ISWS)
W77-00825

THE ROLE OF SEDIMENT PROBLEMS IN HYDROELECTRIC DEVELOPMENT,
Federal Power Commission, Washington, D.C. Office of Energy Systems.
For primary bibliographic entry see Field 4D.
W77-00826

SCOUR AND FILL IN AN EPHEMERAL STREAM,
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
M. G. Foley.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 5-1 - 5-12, 1976. 6 fig, 1 tab, 17 ref. NSF GK 31802, Army DAHC04-74-G-0189.

Descriptors: *Scour, *Landfills, *Deposition(Sediments), *Ephemeral streams, Erosion, Sedimentation, Degradation(Stream), Aggradation, Beds, River beds, On-site investigations, Runoff, Floods, Equations, Flow, Streamflow, Sedimentology.

The classical concept that mean bed elevation over an entire stream reach is lowered by scour during flood-wave passage and is restored by deposition in the waning flood phase (mean-bed scour and fill) can be challenged. The alternative that both scour and fill occur simultaneously at different migrating loci within a reach (local scour and fill) is more consistent with published field data. The field investigation reported herein suggested that mean-bed scour and fill in a natural uniform channel is minor compared to local scour and fill caused by bedform migration. This experiment, utilizing a rectilinear array of buried maximum-scour indicators (scour-cords), produced data for contouring of maximum scour and fill in an ephemeral streambed during two floods. In the first flood, 24 cm (9.5 in) of scour and fill were measured for a bankfull flow depth of 23 cm (9 in). In the second flood, maximum scour and fill were at least 66 cm (26 in) for a bankfull flow depth of 34 cm (13 in). Estimates of antidune amplitudes for the two floods, based on theoretical models and laboratory and field observations, were 28 to 64 cm (11 to 25 in) and 48 to 97 cm (19 to 38 in), respectively. This suggests that all scour and fill measured by the scour-cord array was caused by antidune migration. (See also W77-00775) (Sims-ISWS)
W77-00827

CHARACTERISTICS OF STABLE NATURAL CHANNELS AND THEIR RELATION TO CHANNEL DESIGN,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 8B.
W77-00828

OBSERVED CHANNEL CHANGES IN A MOUNTAIN STREAM DUE TO INCREASED FLOW FROM TRANSBASIN IMPORTS,
Bureau of Reclamation, Denver, Colo. Flood Hydrology Section.
For primary bibliographic entry see Field 8B.
W77-00829

APPLICABILITY OF THE UNIT STREAM POWER EQUATION,
Army Engineer District, Chicago, Ill.
C. T. Yang, and J. B. Stall.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 5-37 - 5-47, 1976. 8 fig, 12 ref. OWRT B-075 - ILL(4). 14-31-0001-3881.

Descriptors: *Sediment transport, *Yield equations, *Sediment discharge, Rivers, Equations, Estimating equations, Sediments, Sediment yield, Flow, Streamflow, Velocity, On-site investigations, Suspended solids, Beds, Streambeds.
Identifiers: Unit stream power equation.

The usefulness of a sediment transport equation to engineering depends on its applicability to natural rivers. Data collected from six river stations were used to compare the applicability of different equations. The comparisons indicated that the dimensionless unit stream power equation is the one which can provide accurate predictions of total sediment discharge in natural rivers under diversified flow and sediment conditions. The limitations to which this dimensionless unit stream power equation can be applied were explained. (See also W77-00775) (Sims-ISWS)
W77-00830

ENTRENCHMENT OF DRAINAGE SYSTEMS IN WESTERN IOWA AND NORTHWESTERN MISSOURI,
Agricultural Research Service, Columbia, Mo.
R. F. Piest, C. E. Beer, and R. G. Spomer.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 5-48 - 5-60, 1976. 7 fig, 1 tab, 12 ref.

Descriptors: *Erosion, *Drainage system *Agricultural runoff, *Iowa, *Missouri, Gullie Gully erosion, Channel morphology, Sedime yield, Channel erosion, Degradation(Stream), Er sion control, Crops, Soil erosion, Sheet erosio Rill erosion, Sedimentation.
Identifiers: *Drainageway erosion.

During the past few decades, drainageway erosi in the loess hills region of Iowa and Missouri h accelerated, and there is little deterrent to co tinued erosion on a massive scale. It is comple linked to the general runoff regimen and changes in soil water content. Overland runo volumes due to intensive cultivation are 2 to times presettlement volumes, and peak flow ra average more than 10 times the presettleme norm that existed before 1850. The erosi problem was assessed from random channel me surements in three counties of the study regi from intensive measurements of sheet-rill a gully erosion rates on experimental watershe near Treynor, Iowa, and from existing sedime yield records. Although measures of sedime yields at downstream locations usually were l than 12 or 13 metric t/ha (5 or 6 t/a) per year, t total upland erosion (sometimes called gross e sion) was significantly greater. Intermediate-s channels draining areas of more than 2.6 sq km sq mi) were degrading rapidly, with average los of 4.5 metric t/ha (2 t/a) sediment annually; gu erosion rates for smaller drainage basins averag at least 4.5 metric t/ha (2 t/a) each year; and t soil losses from sheet-rill erosion on fiel averaged at least 18 metric t/ha (8 t/a) annual (See also W77-00775) (Sims-ISWS)
W77-00831

CHANNEL CHANGES IN THE COLORAD RIVER BELOW GLEN CANYON DAM,
Bureau of Reclamation, Denver, Colo. Engine ing and Research Center.
E. L. Pemberton.
In: Proceedings of the Third Federal Inter-Agen Sedimentation Conference, 1976; Denv Colorado, March 22-25, 1976. Water Resourc Council, Washington, D.C., Sedimentation Co mittee, p 5-61 - 5-73, 1976. 11 fig, 1 tab, 5 ref.

Descriptors: *Channel morphology, *Erosio *Degradation(Stream), *Colorado River, Sa pling, Surveys, On-site investigations, Partic size, Sands, Gravels, Rocks, Sediments, Bott sediments, Channel erosion, Streamflow, Dams.
Identifiers: *Glen Canyon Dam, *Paria River, A moring, Armoring layers.

Construction of Glen Canyon Dam on t Colorado River by the Bureau of Reclamati started in 1956, and the dam was officially clos in March 1963. The 1957 degradation study, bas on a detailed bottom sediment sampling progr in 1956 and an analytical approach to sedime transport and armor, resulted in a prediction about a 1.22-meter (4-foot) degradation immedia ly below the dam and 8.26 million cubic met (6,700 acre-feet) of erosion to take place in t reach above the mouth of the Paria River in abo 14 years. To verify changes since closure of t dam, resurveys of cross sections in the appro mate 24-kilometer (15-mile) reach of the Colora River from Glen Canyon Dam to the mouth of t Paria River near Lees Ferry were made in 19 1963, 1965, and 1975. Bottom sediment samp were also collected in 1966 and 1975 to analyze t changes in material size as a result of the degra tion and armoring process. The resurveys co firmed the 1957 predictive study by noting th sufficient armoring material remained to cont excessive degradation with about 9.87 milli cubic meters (8,000 acre-feet) of material scour from the channel bottom by 1975. This paper su marized the 1957 predictive study of probab degradation and described the changes that ha taken place in the channel from 1956 to 1975. (S also W77-00775) (Sims-ISWS)
W77-00832

ANNEL CHANGES PRODUCED BY THE 3 FLOOD ON THE LOWER MISSISSIPPI VER,
ny Engineer District, Vicksburg, Miss. amology Section.
H. Walters.
Proceedings of the Third Federal Inter-Agency limentation Conference, 1976; Denver, lorado, March 22-25, 1976. Water Resources ncil, Washington, D.C., Sedimentation Com-tee, p 5-74 - 5-85, 1976. 11 fig.

scriptors: *Channel morphology, *Erosion, dimentation, *Mississippi River, Deposi-n(Sediments), Floods, Turbulence, Flow, Sedi-nts, Sands, Gravels, Sand bars, Aerial photog-hy, On-site investigations, Flow charac-stics, Flow profiles, Velocity, Islands, Dikes, ers.

e 1973 flood on the Lower Mississippi River of-ed a unique opportunity to observe the effects a major flood on the morphology of the channel. imited number of segments or reaches of river s chosen for a study of changes based on availa-ty of previous hydrographic surveys and flood color infrared photography. The Togo nd Bend to Middleground Island Reach was ected for discussion in this paper. Water sur-e flow patterns were identified using color in-red photography and surface float measure-nts in conjunction with hydrographic surveys. ld trips taken during the following low water son revealed definite changes in the shape and al extent of both sand bars and islands. In most es, the islands were larger and had increased in vation to near the top bank height of the main nnel. Gravel deposits were present to a greater ent than in previous years. The gravel sizes ob-ved were much larger than could be sampled h the sediment sampling equipment now used. e effects of the 1973 flood clearly indicated that ge floods accelerate changes in channel shape l alter the characteristics of the alluvial osits. (See also W77-00775) (Sims-ISWS)
7-00833

DEL STUDY OF RIVERBED MATERIAL IN NYON FERRY DAM SPILLWAY STILLING SIN,
reau of Reclamation, Denver, Colo. Engineer-and Research Center.
H. Burgi.
Proceedings of the Third Federal Inter-Agency limentation Conference, 1976; Denver, orado, March 22-25, 1976. Water Resources ncil, Washington, D.C., Sedimentation Com-tee, p 5-86 - 5-99, 1976. 5 fig, 1 tab.

scriptors: *Dams, *Settling basins, eposition(Sediments), *Model studies, Hydrau-models, Spillways, Stream stabilization, ers, River beds, Reservoir releases, Reservoir ration, Sediments, Erosion, Sedimentology.
ntifiers: *Canyon Ferry Dam(Mont).

draulic model studies were made to determine cause and recommend a solution for the osit and movement of riverbed material into Canyon Ferry Dam spillway stilling basin. ts indicated that movement of riverbed materi-esults from operation of the river outlet works ischarges greater than 3,000 cu ft/s (85 cu m/s). eral solutions to the problem were suggested, uding a limitation on operation of the river out-to 3,000 cu ft/s (85 cu m/s). Studies were con-ted to determine the effectiveness of the spill-discharge in clearing various amounts of osited material from the basin. As a result of se studies, a recommended spillway discharge applied to the Canyon Ferry stilling basin to n 900 cu yd (688 cu m) of riverbed material n the basin. Soundings of the basin were taken ediately after the suggested release and con-ed the model results. (See also W77-00775) ns-ISWS)
7-00834

SEDIMENTATION IN COON CREEK VALLEY, WISCONSIN,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 4D.
W77-00835

CHANNEL IMPROVEMENTS OF THE MISSOURI RIVER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-00836

PATTERNS OF SCOUR AND FILL IN POOL-RAPID RIVERS,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
E. Silverston, and E. M. Laursen.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 5-125 - 5-136, 1976. 9 fig, 2 ref.

Descriptors: *Rivers, *Scour, *Deposition(Sediments), *Model studies, Mathematical models, Erosion, Sedimentation, Weirs, Control, Flow, Streamflow, Sediment transport, Hydraulics.
Identifiers: *Pool-rapid rivers.

The characteristics of the imaginary pool-rapid river studied in this investigation were completely arbitrary--but not unlike the Colorado River. It was concluded that the seemingly erratic behavior of pool-rapid rivers is subject to rational explanation: Because the change in head on a critical control (rapid or weir) is less than the change in equilibrium depth in the pool upstream, a pool will eventually scour with an increase in flow and fill with a decrease in flow. However, because the supply of sediment to a pool is dependent on the conditions at the outlet of the pool just upstream, initially there may be either scour or fill in the downstream pool with an increase in flow. Indeed, a pool following several other pools may behave in a seemingly erratic manner because its sediment supply is affected by what happens in each of the upstream pools. (See also W77-0075) (Sims-ISWS)
W77-00837

EFFECTS OF SEDIMENTATION ON COASTAL ZONE ORGANISMS,
New York Univ. Medical Center, N. Y. Lab. for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-00838

CHEMICAL AND BIOLOGICAL MOBILIZATION OF HEAVY METALS FROM ESTUARINE SEDIMENTS,
Corps of Engineers, San Francisco, Calif. South Pacific Div.
For primary bibliographic entry see Field 5C.
W77-00839

SEDIMENT TRANSPORT IN THE COASTAL ZONE,
Massachusetts Inst. of Tech., Cambridge. Ralph M Parsons Lab for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 2L.
W77-00840

SEDIMENT DISPERSAL IN WESTERN LAKE MICHIGAN NEAR TWO CREEKS, WISCONSIN, AND THE INFLUENCE OF AN INDUSTRIAL COOLING WATER DISCHARGE,
Wisconsin Univ., Madison. Sea Grant Program; and Wisconsin Univ., Madison. Geo-Environmental and Mineral Resources Program.
M. H. Kohler, and J. R. Moore.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 6-39 - 6-50, 1976. 7 fig, 5 ref.

Descriptors: *Sediments, *Lake Michigan, *Wisconsin, *Sediment transport, *Powerplants, Nuclear powerplants, Cooling water, Discharge(Water), Littoral drift, Sands. Gravels, Clays, Shores, Lakes, Erosion, Sedimentation, Sedimentology, Limnology, Thermal pollution, Path of pollutants.
Identifiers: *Two Creeks(Wis), *Two Rivers(Wis).

The sedimentary regime in Lake Michigan between Two Rivers and Two Creeks, Wisconsin was investigated during four field seasons, 1971-1974. The area was selected because a shoreline industrial cooling water discharge became operational in 1971. Sediment transport patterns, including natural short-term variabilities, were defined. Alterations in the near-shore deposition patterns were noted near the cooling water discharge. The following conditions were found to exist: the offshore sedimentary regime was composed of four types of sediment. Desiccated red clay of Valderan age (Pleistocene) was exposed, with little or no overlying recent sediment, primarily in nearshore waters in the northern half of the study area. Rocky gravels and gravelly sand predominantly occupied a lobate zone in the intermediate depths in the northern sector. Sand, mainly in the fine sand class, dominated the southern portion of the area, from the shoreline to depths exceeding 30 m (100 ft) and extended northward in a band east of the rocky gravels and gravelly sands. Muddy sands were found beneath the deepest waters and in intermittent patches elsewhere. As indicated by the increase in sorting and decrease in grain size, the net transport of sediments offshore was north to south through the study area. Along the shoreline, the transport direction periodically reversed, but the net transport was from north to south. Pleistocene drift deposits formed bluffs at the back-beach north of Two Creeks and acted as a source for the modern sediments. (See also W77-00775) (Sims-ISWS)
W77-00841

COASTAL EROSION IN EASTERN LAKE MICHIGAN,
University of South Florida, Tampa. Dept. of Geology.
R. J. Davis Jr.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 6-51 - 6-61, 1976. 5 fig, 1 tab, 10 ref. Army DACW 72-70-0037, Army DACW 72-73-C-0003.

Descriptors: *Lake Michigan, *Beach erosion, *Shores, Erosion, Storms, Waves(Water), Winds, Lakes, Water levels, Geology, Geomorphology, Beaches, Weather data, Meteorological data, Sediments, Sedimentation

Rapid and extensive erosion has taken place throughout the eastern coast of Lake Michigan during the past several years (1968-73). The result has been millions of dollars of property loss and damage. Detailed monitoring of 17 beach profiles along nearly 200 miles of the Lake Michigan coast has provided substantial insight into the nature of the erosion and its probable causes: Rapidly rising lake level caused the beach and adjacent dunes or bluffs to be vulnerable to wave attack. Erosion was quite localized during the first two years of the study and did not become universal until the final year (1972-73). During most times, local factors predominated in controlling erosion and/or accretion on the coast. Longshore sand bars, coastal composition, and shoreline configuration were most significant. Erosion was common during the intense storms of late fall just prior to the formation of coastal ice and to a lesser extent just

after ice melting in early spring. Single storms seemed to cause the bulk of the annual erosion at a given site. Rapid recovery of the beach seemed to take place between individual storms, however, during later fall, their frequency was such that recovery was not possible. (See also W77-00775) (Sims-ISWS)
W77-00842

A TIME RELATED AUTOMATIC TOTAL-LOAD SEDIMENT SAMPLER,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
K. G. Renard, J. R. Simanton, and L. D. Donica.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 7-17 - 7-29, 1976. 9 fig, 1 tab, 6 ref.

Descriptors: *Instrumentation, *Sediments, *Sampling, Runoff, Equipment, Potentiometers, Sedimentation, Erosion, Water sampling, Electronic equipment, Electrical equipment, Watersheds(Basins), Sedimentology.
Identifiers: *Sediment samplers.

A total-load, automatic, sediment sampler was developed and tested for use with small runoff measuring flumes. The system collected individual, total-load, sediment samples which provided periodic sediment concentration data during a runoff event. The system consisted of two parts, the sampler and the collector. The sampler was a vertical slot that traversed on a horizontal rail through the flow at the flume's exit. The traverse speed was regulated by flow depth and aliquot size. The collector was a revolving table with a capacity of 18 2-liter (about 0.5 gal) bottles. Table rotation was regulated by a timer and a new bottle was filled with each traverse. The time of each traverse was recorded on the stage record. The system was powered by a 12-volt, DC battery charged by a solar generator, which allowed using the system in remote areas where conventional electrical power was not available. (See also W77-00775) (Sims-ISWS)
W77-00843

THE USE OF COLOR INFRARED PHOTOGRAPHY FOR THE DETERMINATION OF SUSPENDED SEDIMENT CONCENTRATIONS AND SOURCE AREAS,
Forest Service (USDA), Fort Collins, Colo. Arapaho-Roosevelt National Forest.
D. L. Rosgen.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 7-30 - 7-42, 1976. 11 fig, 1 tab, 16 ref.

Descriptors: *Remote sensing, *Aerial photography, *Suspended solids, *Turbidity, Streams, Watersheds(Basins), Mountains, Snowmelt, Runoff, On-site investigations, Sampling, Erosion, Channel erosion, Photography, Infrared radiation, Sediments, Sediment discharge, Data processing, Analytical techniques.

The concepts and special techniques for applying color infrared photography in sediment studies were presented. These techniques were developed and evaluated through a low elevation color infrared photography flight and concurrent water quality sampling conducted on 164 km (100 miles) of stream over the West Fork of the Madison River in southwestern Montana. The concentrations and sources of sediment produced during peak snowmelt runoff were determined by photo densitometric analysis coupled with specifically located ground control stations. Excell correlations were established by regression analysis of the ground truth variables including stream width to discharge and suspended sediment to turbidity. Photo density was correlated with suspended sediment and turbidity. Both produced strong correlations which were significant at the 99% confidence level. These correlations made it possible to determine reliable estimates of sediment concentrations from the aerial photography where stream measurements were not obtained. The photographic analysis indicated that the majority of the suspended sediment sources during the snowmelt runoff event were derived primarily from channel erosion. Additional interpretations which can be derived from photo analysis were also presented and discussed. (See also W77-00775) (Sims-ISWS)
W77-00844

GAGING SEDIMENT-LADEN FLOWS WITH V-NOTCH WEIRS,
Agricultural Research Service, Columbia, Mo. North Central Watershed Research.
K. E. Saxton, and J. F. Ruff.
In: Proceeding of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 7-43 - 7-53, 1976. 4 fig, 1 tab, 9 ref. ARS 12-14-3001-223.

Descriptors: *Weirs, *Gaging stations, *Stream gages, *Streamflow, Flow, Runoff, Measurement, Suspended solids, Deposition(Sediments), Discharge(Water), Hydraulic structures, Calibrations, Model studies, Hydraulic models, Alluvial channels.
Identifiers: Broad-crested weirs, V-notch weirs, Weir calibrations.

Watersheds with areas of less than 1 sq mi (2.59 sq km) often have streamflow with stages that rise and fall rapidly. These rapid stage changes prevent accurate field calibration of streamflow gaging stations by usual techniques; therefore, a reliable, precalibrated measuring device is necessary. Also, the streamflow from these small watersheds is often heavily laden with sediment (up to 200,000 ppm), and the alluvial stream channels change their cross section and slope upstream of the measuring device. These sloping and aggrading approach channels can change the stream gage calibration. Broad-crested, V-notch weirs, developed by the U. S. Soil Conservation Service, have been used extensively. Recent evidence has shown that different approach channel slopes and shapes and sediment deposits cause significant deviations from the original calibrations. Model studies were conducted to define the effect of approach channel geometry and sediment deposits on the weir calibrations. A rigid-boundary model was used for the tests. Channel slopes were 0.0, 0.5, 1.0, 1.5, and 2.0% for several approach channel cross sections. The results provided improved calibrations for broad-crested, V-notch weirs for gaging sites in alluvial channels. (See also W77-00775) (Sims-ISWS)
W77-00845

SEDIMENT RUNOFF DURING HIGHWAY CONSTRUCTION,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4C.
W77-00847

SEDIMENT MOVEMENT INDUCED BY SHIPS IN RESTRICTED WATERWAYS,
Texas A and M Univ., College Station. Ocean Engineering Program.
For primary bibliographic entry see Field 2L.
W77-00886

CURRENTS AND CIRCULATION IN THE COASTAL WATERS OF LOUISIANA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2L.
W77-00887

MILD SLOPE STABLE CHANNELS. STOCHASTIC DESIGN APPROACH,
Florida Univ., Gainesville. Dept. of Civil gineering.
B. A. Christensen.
Florida Sea Grant Report presented at ASCE nual Convention, held at San Diego, Califo April 5-8, 1976. 28 p, 23 ref. SG-04-5-158-44.

Descriptors: *Erosion, *Sedimentation, *Soil perties, *Canal design, Canals, Chan Stochastic processes, *Slopes, Synthetic hyd gy, Design criteria, Slope stabilization, Cha morphology.
Identifiers: *Hydrodynamic lift, Channeliza *Design charts.

A method for design of a clear water stable c nel in noncohesive soil deposits of sand or s and with a bed slope which is so small that pro with a horizontal middle part cannot be used, developed. The influence of the hydrodynami acting on the topmost layer of grains is taken consideration by use of Einstein and El-San lift coefficient. The stochastic nature of this l considered by introduction of the probabilit erosion. All formulas needed for the design an development of the design charts are given. D space limitations, most of the derivations omitted. The method is extended to stable t zoidal and triangular cross sections. (NOAA)
W77-00896

COASTAL ENGINEERING DATA NETWOR
California Univ., San Diego, La Jolla. Ins Marine Resources.
For primary bibliographic entry see Field 2L.
W77-00898

ENVIRONMENTAL ASSESSMENT OF ALASKAN CONTINENTAL SHELF. VOLU 13. GEOLOGY.
National Oceanic and Atmospheric Admini tion, Boulder, Colo. Environmental Research
For primary bibliographic entry see Field 6G.
W77-00913

SHORELINE EROSION: IMPLICATIONS PUBLIC RIGHTS AND PRIVATE OWNERSH
For primary bibliographic entry see Field 6E.
W77-00982

2K. Chemical Processes

APPLICATIONS OF AUTOMATIC EQUIPM TO WATER ANALYSIS,
For primary bibliographic entry see Field 5A.
W77-00597

A SIMPLE TUBE-TYPE WATER PROF SAMPLER,
Agricultural Research Service, Phoenix, Water Conservation Lab.
For primary bibliographic entry see Field 5A.
W77-00641

HYDROCHEMISTRY OF THE PARANA RIV
Instituto Nacional de Limnologia, Santo T (Argentina).
P. J. Depetris.
Limnology and Oceanography, Vol. 21, No. 736-739, September 1976. 3 fig, 2 tab, 9 ref.

Descriptors: *Water chemistry, *Rivers, *S America, *Sampling, Chemical analy Suspended solids, Dissolved solids, Chemic Surveys, Salts, Monthly, Rocks, Geochemi Erosion, Pollutant identification.
Identifiers: *Parana River(Argentina), *Argent

cent monthly data from the Parana River wed that its hydrochemistry is controlled by nature of the rocks in the basin, with signifi- t contributions from saline environments dur- low discharge. The discharge-weighted mean solved salts concentration (79.8 mg/liter) al- ed a new calculation of 56.7 mg/liter for the an dissolved salts concentration of South erican rivers. (Sims-ISWS)
7-00644

POSITS FORMED BY SUBGLACIAL ECIPITATION OF CAC03,
lifornia Univ., Los Angeles. Dept. of Geology.
Hallet.
ological Society of America Bulletin, Vol. 87, . 7, p 1003-1015, July 1976. 9 fig, 2 tab, 64 ref, 1 end. NSF GA-40497X.

scriptors: *Calcium carbonate, *Limestones, hemical precipitation, *Glaciers, Carbonate ks, Geology, Rocks, Geologic investigations, omorphology, Freezing, Chemistry, Ice, Calci- compounds, Laboratory tests.
ntifiers: Calcium carbonate precipitation, Sub- cial limestone, Glacial geology, Glacial sliding, ezing calcium carbonate solutions.

nestone and other calcareous outcrops recently osed by retreating temperate glaciers in the cky Mountains are widely covered with patchy bonate coatings that formed as a result of mical precipitation under the moving ice. They m because CaC03 dissolved from the bedrock the stoss sides of bed obstacles is concentrated he lee sides by the freezing of the meltwater in regelation-slip process, which is an essential t of the mechanism by which temperate glaciers le over their beds. Freezing experiments wed that ice grown from CaC03 solutions at es similar to those expected in connection with elation sliding had calcium ion concentrations to 100 times smaller than the solutions; hence freezing process strongly concentrated solutes the melt. The experimental results were in- preted in terms of the pertinent phase relations, ich were derived numerically on the basis of the st recent solubility data for calcite and an esti- te of the freezing point lowering due to the sence of solutes. It was concluded that the sub- cial chemical deposits indicate clearly that mical exchange is active under temperate ciers and that glacio-chemical processes do at es play a dominant role in modifying the glacial l. Moreover, they are of particular interest cause the chemical and physical processes by ich they form may affect the behavior of entire cial masses by impeding basal sliding. (Sims- WS)
7-00658

YSICAL AND CHEMICAL CHARAC- RISTICS OF SEDIMENTS ORIGINATING OM MISSOURI VALLEY LOESS,
ricultural Research Service, Cheyenne, Wyo. rth Central Region.
r primary bibliographic entry see Field 5B.
7-00811

E USE OF COLOR INFRARED PHOTOG- PHY FOR THE DETERMINATION OF SPENDED SEDIMENT CONCENTRATIONS D SOURCE AREAS,
rest Service (USDA), Fort Collins, Colo. apaho-Roosevelt National Forest.
r primary bibliographic entry see Field 2J.
7-00844

ALYSIS OF HISTORICAL WATER-QUALI- DATA AND DESCRIPTION OF PLAN FOR A MPLING NETWORK IN CENTRAL AND UTHERN FLORIDA,
ological Survey, Tallahassee, Fla.
r primary bibliographic entry see Field 5A.
7-00858

GEOLOGY AND GROUND-WATER RESOURCES OF CAMDEN COUNTY, NEW JERSEY,
Geological Survey, Trenton, N. J.
For primary bibliographic entry see Field 2F.
W77-00866

2L. Estuaries

THE EPIBIOTIC FLORA AND FAUNA OF THE SERPULID ZONE IN THE LITTORAL REGION ON THE MUKKAN COAST (BAY OF BENGAL), (IN ITALIAN),
Andhra Univ., Waltair (India)
K. V. Rao, and K. K. Rao.
Riv Idrobiol 12(2/3), p 71-95, 1973.

Descriptors: *Littoral, *Bays, Aquatic animals, Aquatic plants, Sediments, Coasts.
Identifiers: *Epibiotic fauna, Mukkan Coasts(India), *Bay of Bengal(India), *Epibiotic flora.

The serpulid zone of the Mukkan coast (India) 40 km N of Visakhapatnam (Bay of Bengal) was investigated qualitatively and quantitatively for faunal associations. A total of 67 spp. belonging to 18 animal groups are given. An average density of 30.82 organisms/cm3 was found. The importance of sessile animal growths as a littoral habitat is emphasized. The morphology of the substratum, wave action and sediment accumulation are the factors controlling animal diversity. Possible factors for the coexistence of the littoral animals are indicated.—Copyright 1976, Biological Abstracts, Inc.
W77-00530

DEVELOPMENT OF A SYSTEM TO DETECT AND MONITOR SEDIMENT POLLUTION,
Rhode Island Univ., Kingston. Dept. of Civil and Ocean Engineering.
For primary bibliographic entry see Field 5B.
W77-00539

HYDROGEN SULFIDE IN BOTTOM WATER NEAR A SEWAGE SLUDGE DUMPING SITE,
Brookhaven National Lab., Upton, N.Y. Dept. of Applied Science.
For primary bibliographic entry see Field 5A.
W77-00620

MANGANESE IN NARRAGANSETT BAY,
Rhode Island Univ. Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5A.
W77-00642

FORCES ON A ROUGH BED IN OSCILLATORY FLOW,
Cambridge Univ. (England). Dept. of Engineering.
J. F. A. Sleath.
Journal of Hydraulic Research, Vol. 14, No. 2, p 155-164, 1976. 8 fig, 14 ref.

Descriptors: *Ocean waves, *Drag, *Laminar flow, *Hydraulics, *Numerical analysis, Reynolds number, Roughness(Hydraulic), Analytical techniques, Boundary layers, Sediment transport.
Identifiers: *Lift force, *Oscillatory flow, Wave period.

Results are presented of numerical and analytical solutions for the drag and lift forces exerted in laminar flow on a two-dimensionally rough bed by wave action: Bottom friction causes attenuation of the waves as they approach the coast, and the longshore current is affected by bed friction as well as the sediment transport. Only two-dimensional bed roughness is considered when bed roughness length is large compared with the boundary layer thickness. When bed roughness size is small compared with the thickness of the viscous boundary layer, the lift force is negligible compared with the drag. The component of drag due to shear stress is much larger than the resolved component of pressure on the bed. For particles whose size is large compared with the thickness of the viscous boundary layer, the aforementioned conclusions do not apply. For moderate to high values of the ratio of amplitude of the horizontal component of velocity outside the boundary layer to kinematic viscosity divided by the wave period, the lift may completely dominate the initial motion of the sediment. (Singh-ISWS)
W77-00650

FINESTRUCTURE AND MICROSTRUCTURE OBSERVATIONS DURING THE PASSAGE OF A MILD STORM,
Washington Univ., Seattle. Dept. of Oceanography; and Washington Univ., Seattle. Applied Physics Lab.
M. C. Gregg.
Journal of Physical Oceanography, Vol. 6, No. 4, p 528-555, July 1976. 20 fig, 6 tab, 25 ref. ONR N00014-69-A-0200-6049.

Descriptors: *Oceans, *Storms, *On-site investigations, *Pacific Ocean, *Temperature, Winter, Water temperature, *Salinity, Density, Fluctuations, Air-water interfaces, Heat transfer, Winds, Equations, Mixing, Data processing, Meteorology, Oceanography.
Identifiers: Finestructure, Microstructure.

Finestructure and microstructure observations of temperature and salinity were made over a two-week period in late winter at a site in the central North Pacific, during which time a mild storm, maximum winds of 18 kt, passed through the area. The strong initial lateral variability in T and S, but weak vertical stratification, was altered, apparently by mixing due to surface cooling and the storm winds to produce several discrete types of water. These discrete types of water began to spread laterally several days after the onset of the storm and resulted in a triple step structure of 50 m thick homogeneous layers at one location. The 2.5 m thick transition region at the base had a sharp interface, 0.25 m thick, but there was no evidence of entrainment. A few days later a mixed layer half as thick, apparently resulting from the intrusion of denser water beneath, showed a transition with numerous small-scale instabilities and an overturn on a 0.12 m thick interface directly below the mixed layer. In the stratified water below the surface layers, the levels of microstructure detected during the storm appeared little different from those found afterward. (Sims-ISWS)
W77-00653

A CYCLESONDE VIEW OF COASTAL UPWELLING,
Rosenstiel School of Marine and Atmospheric Science. Miami, Fla.
W. R. Johnson, J. C. Van Leer, and C. N. K. Mooers.
Journal of Physical Oceanography, Vol. 6, No. 4, p 556-574, July 1976. 18 fig, 26 ref, 1 append. NSF IDOE GX-33052, NSF DES72-0147 A03.

Descriptors: *Upwelling, *Pacific Ocean, *Oregon, *On-site investigations, Continental shelf, Continental slope, Instrumentation, Circulation, Flow, Water circulation, Ocean circulation, Velocity, Temperature, Water temperature, Density, Data processing, Oceanography.

In August 1973, 320 vertical profiles of temperature and horizontal velocity were recorded during a 64 h period by an array of three Cyclesondes in the coastal upwelling region off Oregon. The mean interior alongshore velocity was geostrophic and a linear function of density, with a near-surface, equatorward jet at mid-shelf, and a poleward undercurrent at the shelf break. The mean cross-shelf flow was relatively weak and substantially

ageostrophic; it was suggestive of a two-cell (co-rotating) circulation within the mid-shelf frontal zone and a two-cell (counter-rotating) circulation near the shelf break. The direction of the mean, near-bottom, cross-shelf flow was consistent with a bottom Ekman layer driven by the mean near-bottom alongshore flow. At mid-shelf, near-inertial motions with a vertical wavelength of 50 m, upward phase velocity, and downward group velocity persisted throughout the record. The hourly vector shears indicated a layer of persistent shear instability at the base of the upwarped permanent pycnocline at mid-shelf. There the near-inertial shear was twice as great as the mean shear; therefore, it may have played a dominant role in mixing processes. It was concluded that in coastal upwelling regions, a vertical resolution of 10-20% of the water depth and a temporal resolution of 10-20% of an inertial period are probably necessary and sufficient to produce coherent fields of the slowly varying horizontal velocity. (Sims-ISWS)
W77-00654

ON A MID-OCEAN THERMOCLINE REGIME,
Washington Univ., Seattle. Dept. of Oceanography.
P. Welander, and C-T. Liu.
Journal of Physical Oceanography, Vol. 6, No. 4, p 592-595, July 1976. 6 fig, 5 ref. NSF DES74-13339.

Descriptors: *Thermocline, *Oceans, *Water temperature, Winds, Temperature, Model studies, Mathematical models, Circulation, Equations, Ocean circulation, Heat transfer, Boundaries(Surfaces), Physical properties, Thermal properties, Oceanography.

In a uniform-depth ocean forced by a wind stress and surface heat flux (or surface temperature) which are independent of longitude, there exists a possible thermocline regime with vanishing east-west temperature gradient. The associated meridional-vertical circulation is entirely wind-driven, producing a deep thermal structure at high latitudes, a thin equatorial thermocline, and a vertical thermal front at the latitude of vanishing Ekman downwelling. Some numerical examples were given. (Sims-ISWS)
W77-00656

THE FORMATION OF THE YUCATAN CURRENT BASED ON OBSERVATIONS OF SUMMER 1971,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
R. L. Molinari.
Journal of Physical Oceanography, Vol. 6, No. 4, p 596-602, July 1976. 5 fig, 1 tab, 4 ref. NSF AG-253.

Descriptors: *Currents(Water), *Ocean currents, *Thermal properties, Temperature, Salinity, Buoys, Coriolis force, Circulation, Ocean circulation, Water circulation, Oceanography.
Identifiers: *Yucatan current, *Caribbean Sea, *Gulf Stream, Drifter data.

Temperature, salinity, and Lagrangian current data collected during the summer of 1971 in the western Caribbean Sea were employed to evaluate the ageostrophic components of the flow in the formation region of the Yucatan Current. The ratio of tangential and centripetal accelerations to Coriolis acceleration for data averaged over 24 h periods remained less than 10% except in two areas. An anticyclonic turn, centered at 19 deg 30 min N, 86 deg W, had the largest centripetal accelerations, and in the region of Cozumel Island significant tangential accelerations occurred. The large-scale accelerations and additional evidence supported the hypothesis that inertial effects dominate in the formation of the Yucatan Current. (Sims-ISWS)
W77-00657

TIDAL PRISM - INLET AREA RELATIONSHIPS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. T. Jarrett.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 327, Price codes: A03 in paper copy, A01 in microfiche. GITI Report 3, February 1976. 55 p, 19 fig, 4 tab, 20 ref, append.

Descriptors: *Inlets(Waterways), *Tides, *Jetties, Channels, Bays, Estuaries, Flow, Tidal bores, Harbors, Waves(Water), Coasts, Shores, Oceanography.
Identifiers: *Tidal prisms.

The tidal prism-inlet area relationships for inlets on sandy coast established by M. P. O'Brien (See 74-03695) were reanalyzed using his data and data published by other investigators. In addition, tidal prism and inlet cross-sectional area data developed in the Inlet Classification Study, a subfeature of the Corps of Engineers General Investigation of Tidal Inlets, were also used. These data resulted in a total of 162 data points for 108 inlets--59 of which were located on the Atlantic coast, 24 on the Gulf coast, and 25 on the Pacific coast of the United States. The data were grouped into three main categories, namely: (1) all inlets, (2) unjettied and single-jettied inlets, and (3) inlets with two jetties. Within each of these three categories, the data were further subdivided into: (1) inlets on all three coasts, (2) inlets on the Atlantic coast, (3) inlets on the Gulf coast, and (4) inlets on the Pacific coast. Regression analysis was performed on each set of data to determine the equations of best fit and to establish 95% confidence limits for the equations and the constants in the equations. The results of the regression analysis, which in all cases yielded an equation of the form A = C(P to the nth power), in which C and n are constants determined by the regression analysis, indicated that the tidal prism-inlet area relationship is not a unique function for all inlets, but varies depending on inlet location and whether or not the inlet has been stabilized with a dual jetty system. (Sims-ISWS)
W77-00664

HEAT DISPERSION IN PHYSICAL ESTUARINE MODELS; REPORT 2, EXPERIMENTS IN THE DELAWARE RIVER MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W77-00665

INTERRELATIONSHIPS BETWEEN CERTAIN MICROORGANISMS AND SOME ASPECTS OF SEDIMENT-WATER NUTRIENT EXCHANGE IN TWO BAYOU ESTUARIES, PHASES I AND II,
University of West Florida, Pensacola. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-00674

OYSTER SETTING AND EARLY SPAT SURVIVAL AT CRITICAL SALINITY LEVELS ON NATURAL SEED OYSTER BEDS OF DELAWARE BAY,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Zoology.
H. H. Haskin, and S. M. Tweed.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-259 537, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Research Institute, Rutgers University, New Brunswick, N. J. July, 1976. 66 p, 8 fig, 24 tab, 49 ref. OWRT B-037-NJ(1), 14-01-0001-3307.

Descriptors: *Oysters, *Predation, *Mortality, *Salinity, *Estuarine fisheries, Estuaries, Mollusks, Shellfish, Bottom fauna, Fouling, Compe
tion, Benthos, Bays.
Identifiers: *Oyster seed beds, *Salinity gradie
*Delaware Bay, Oyster drills, Fouling communi
Mud crabs.

Long-term observations on the natural seed oys
beds of Delaware Bay had shown that althou
supply of oyster larvae and setting potential
not differ over the area, survival of spat w
higher by a factor of 10 in fresher up-bay ar
compared with higher salinity beds dowb-bay, T
oyster drill, Urosalpinx cinerea Say, a comm
predator on higher salinity beds, accounted
some of the differential. The question was whet
other benthic species differences, controlled
salinity differences on the beds, were also imp
tant. To answer this question two beds, one ab
and one below the drill line, were compared
detail in spat survival. During this project the d
population on the lower bed was sharply reduc
probably resulting from an unusual pattern of ri
flows. Set on native shell compared with clean t
shells was reduced to 50% and 20% on the up
and lower bed respectively. Spat mortality in
first week after setting, averaging about 40%
both beds, was mostly due to predation by
large population of xanthid crabs (150-250 per M
Beyond the first week, mortality rates decli
more rapidly on the lower than on the upper bed
spat outgrew small predators. The resulting rev
sal in survival ratios on upper and lower be
coincident with reduced drill populations on
lower bed, implies strongly that in the past the d
has been largely responsible for the comparativ
poor survival of early set on the lower beds.
W77-00676

**HOUSING DEVELOPMENT CANALS IN T
COASTAL ZONE OF THE GULF OF MEXIC
ECOLOGICAL CONSEQUENCES, REGUL
TIONS, AND RECOMMENDATIONS,**
National Marine Fisheries Service, St. Petersbu
Fla. Environmental Assessment Div.
For primary bibliographic entry see Field 6G.
W77-00701

**DETRITUS FORMATION FROM EELGRA
(ZOSTERA MARINA L.): THE RELATIVE I
FECTS OF FRAGMENTATION, LEACHIN
AND DECAY,**
Dalhousie Univ., Halifax (Nova Scotia).
For primary bibliographic entry see Field 5C.
W77-00715

**SEASONAL FLUCTUATIONS OF DIELDR
RESIDUES IN THE TISSUES OF THE MAR
CLAM, RANGIA CUNEATA, FROM A TEX
ESTUARY,**
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 5B.
W77-00717

**WORKSHOP PROCEEDINGS: CITIZEN PA
TICIPATION IN WATER RESOURCES DE
SION-MAKING,**
Massachusetts Univ., Amherst. Water Resour
Research Center.
For primary bibliographic entry see Field 6B.
W77-00730

**PROCEEDINGS OF THE THIRD FEDER
INTER-AGENCY SEDIMENTATION CO
FERENCE 1976.**
Water Resources Council, Washington, D.C. Se
mentation Committee.
For primary bibliographic entry see Field 2J.
W77-00775

URCES AND SEDIMENT YIELD OF AWAIIAN WATERSHED AND COASTAL DIMENTS,
waii Univ., Honolulu. Dept. of Geology and ophysics; and Hawaii Inst. of Geophysics.
r primary bibliographic entry see Field 2J.
7-00791

LE OF THE SEDIMENTATION IN THE LF-PURIFICATION OF THE SCHELDT TUARY,
oratoire de Recherches Hydrauliques, Ant-rp (Belgium).
r primary bibliographic entry see Field 5B.
7-00815

DIMENT TRANSPORT CHARACTERISTICS THE UPPER SAN FRANCISCO BAY-DELTA TUARY,
reau of Reclamation, Sacramento, Calif. Mid-ific Regional Office .
Rumboltz, J. F. Arthur, and M. D. Ball.
Proceedings of the Third Federal Inter-Agency limentation Conference, 1976; Denver, orado, March 22-25, 1976. Water Resources ncil, Washington, D.C., Sedimentation Com-tee, p 4-12 - 4-25, 1976. 10 fig, 2 tab, 13 ref.

scriptors: *Sediment transport, *Estuaries, vers, *California, Sediments, Turbidity, spended solids, Export, Canals, Bypasses, odways, Deltas, Flow, Sediment discharge, al waters, Salinity, Winds, Water circulation.
ntifiers: *San Francisco Bay-Delta Estuary, cramento River, *San Joaquin River.

liment transport in the San Francisco Bay-ta Estuary of California is being investigated an Interagency, Federal and State study group art of an overall investigation to assess the im-t of water resources development on the ecolo-of the Estuary. Transport characteristics of pended sediment in the upper San Francisco -Delta system east of San Pablo Bay were cussed. Analysis of the river discharge and pended solids data (1960-1969) indicated that r 88% of the sediment discharge by the rivers he Delta originates in the Sacramento River in. The analysis also indicated that during the vember through April period, 80% of the an-l sediment discharge from the rivers enters the ta. Suspended solids transport through the uary was primarily controlled by river inflow, ort pumping, tidal exchange, two-layered flow arine circulation, and surface wave action. A f summary of sediment discharge to the Bay-ta Estuary and a general description of the fac-influencing transport of sediments through the uary were presented. (See also W77-00775) ns-ISWS)
7-00817

DIMENT TRANSPORT STUDIES IN THE LTA-MENDOTA CANAL AND THE LIFORNIA AQUEDUCT,
eau of Reclamation, Sacramento, Calif. Mid-ific Regional Office.
Arthur, and N. W. Cederquist.
Proceedings of the Third Federal Inter-Agency imentation Conference, 1976; Denver, orado, March 22-25, 1976. Water Resources ncil, Washington, D.C., Sedimentation Com-ee, p 4-88 - 4-100, 1976. 4 fig, 3 tab, 15 ref.

criptors: *Sediment transport, *Sediments, ms, *Canals, California, Export, Sedimenta-, Aqueducts, Deposition(Sediments), Surveys, pling, Suspended solids, Sediment load, Sedi-t distribution, Sediment yield, Sediment con-Sediment rates, Sedimentology.
tifiers: *California Aqueduct, *Delta-Men-Canal(Calif), *Sacramento River, *San quin River.

The Delta-Mendota Canal (DMC), completed in 1951, has experienced capacity problems, currently attributed to a combination of design deficiency and the accumulation of sediment and clam deposits. The findings of studies conducted in 1973-74 on the sediment-clam deposition problem in the DMC were summarized and it was concluded that sediment in the water is bound by the excreta of the Asiatic clam (Corbicula manilensis). This accumulation of sediment-clam deposits causes a reduction in canal capacity, in addition to the design deficiency loss. Also, sediment transport characteristics of the DMC and the California Aqueduct were compared. Significant differences between the two intake facilities were indicated. Approximately 70% of the sediment entering the Aqueduct was deposited in Clifton Court Forebay and Bethany Reservoir, while only 10% was deposited in the DMC intake channel. The difference in sediment deposition was attributed to differences in design and operation of the intake facilities. The concentration of total suspended solids entering the DMC was found to vary directly with total delta export and vary inversely with the solids concentration of the Sacramento River, the primary source of delta export water. (See also W77-00775) (Sims-ISWS)
W77-00822

EFFECTS OF SEDIMENTATION ON COASTAL ZONE ORGANISMS,
New York Univ. Medical Center, N. Y. Lab. for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-00838

SEDIMENT TRANSPORT IN THE COASTAL ZONE,
Massachusetts Inst. of Tech., Cambridge. Ralph M Parsons Lab for Water Resources and Hydrodynamics.
W. D. Grant, and O. S. Madsen.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 6-28 - 6-38, 1976. 3 fig, 13 ref.

Descriptors: *Sediment transport, *Coasts, *Waves(Water), *Currents(Water), Deposition(Sediments), Scour, Model studies, Mathematical models, Suspended solids, Sediments, Sands, Equations, Breakwaters, Computers, Flow, Topographic mapping, Ocean waves, Shores.
Identifiers: Oscillatory flow.

The results of research on initiation of motion and sediment transport in unsteady oscillatory flow from a research program underway at Massachusetts Institute of Technology were summarized. The results showed the Shields criterion for initiation of sediment motion in steady flow to hold also for unsteady, oscillatory flow when the Shields parameter was based on the maximum bottom shear stress. A quasi-steady application of the Einstein-Brown sediment transport relationship was shown to yield a fairly good representation of experimental data on sediment transport in oscillatory flow. The relationship was then modified for application to sediment transport by waves and currents. An example was given from a computer application for sediment transport in the vicinity of a semi-infinite breakwater subject to a spatially varying wave and current field, in which the maximum wave orbital velocity, u sub b = 1.15 m/sec (3.8 ft/sec), was considerably larger than the current velocity, U = 0.15 m/sec (0.5 ft/sec). The results were presented in a topographical map showing areas of scour and accretion of the order 2 cm/day (0.78 in) at a maximum. (See also W77-00775) (Sim-ISWS)
W77-00840

BIOLOGICAL EFFECTS OF HEAVY METALS ON JUVENILE BAY SCALLOPS, ARGOPECTEN IRRADIANS, IN SHORT-TERM EXPOSURES,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-00872

UPTAKE AND RELEASE OF PHOSPHORUS BY PHYTOPLANKTON IN THE CHESAPEAKE BAY ESTUARY, USA,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 5C.
W77-00874

DIVERSITY OF MARINE INVERTEBRATES IN A THERMAL EFFLUENT,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W77-00883

SEDIMENT MOVEMENT INDUCED BY SHIPS IN RESTRICTED WATERWAYS,
Texas A and M Univ., College Station. Ocean Engineering Program.
Y-C. Liou, and J. B. Herbich.
Report No. TAMU SG 76-209, August 1976. 98 p, 28 fig, 7 tab, 34 ref. Also as COE Report No. 188. TAMU-SG-76-209, SG-04-5-158-19.

Descriptors: *Sediment transport, Ships, *Channels, *Water pollution, Numerical analysis, Computer programs, Inland waterways, Model studies.
Identifiers: *Waterways(Transportation), *Waterways(Watercourses), Momentum theory, Channel bottom, Ship's propellers.

A numerical model using the momentum theory of the propeller and Shields' diagram was developed to study sediment movement induced by a ship's propeller in a restricted waterway. The velocity distribution downstream of the propeller was simulated by the Gaussian normal distribution function. The shear velocity and shear stress were obtained using Sternberg's formulas. Once the ship's speed, depth of the waterway, RPM and diameter of the propeller, and draft of the ship are given, the velocity distribution and the grain size of the initial motion could be obtained from this model. A computer program was developed to solve it. Case studies are presented to show the influence of significant factors on sediment movement at the channel bottom induced by a ship's propeller. (NOAA)
W77-00886

CURRENTS AND CIRCULATION IN THE COASTAL WATERS OF LOUISIANA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
S. P. Murray.
Publication No. LSU-T-76-003 and CSI Technical Report No. 210, June 1976. 39 p, 45 fig. N00014-75-C-0192.

Descriptors: *Estuaries, *Coasts, *Tidal waters, *Salinity, *Salt balance, *Tides, Hydrography, Water resource, *Water circulation, *Currents(Water), *Tidal effects, Bays, Effluents, *Louisiana, Gulf of Mexico, Wetlands.
Identifiers: Water motion, Salt wedge, Coastal marshes, *Tidal currents.

A review of knowledge of circulation and currents in the coastal water of Louisiana indicates that we lack a rudimentary knowledge of the mechanics of water motion along most of the coastline. Detailed salt balance and turbulent mixing studies should now be undertaken. Apparent ignorance prevails except for seasonal salinity patterns and the occasional isolated study. Detailed knowledge of the

dynamics of our prolific coastal bays and estuaries is embarrassingly poor. Existing numerical models of Barataria Bay and Chandeleur-Breton Sound may offer a shortcut to overcoming this disadvantage. Tidal passes, minor river mouths, and the circulation within the wetlands proper have been subject to sporadic, short-term measurement programs, but definitive studies of the flux of mass, heat, salt, and other important scalars have yet to be performed. A list of research priorities to eventually allow better utilization of our coastal waters is presented. (NOAA)
W77-00887

MARINE AND ESTUARINE SANCTUARIES. PROCEEDINGS OF THE NATIONAL WORKSHOP ON SANCTUARIES, 28-30 NOVEMBER 1975, WASHINGTON, D. C.,
Virginia Inst. of Marine Science, Gloucester Point.
M. P. Lynch, B. L. Laird, and T. F. Smolen.
Special Scientific Report No. 70, February 1974. 219 p, 10 tab. NOAA 3-35406.

Descriptors: *Estuaries, *Coastal plains, *National Parks, *Ecosystems, *Land use, *Resources development, *Water pollution, Natural resources, Meetings, Continental shelf, Conservation, Management, Environmental control, Waste disposal, Minerals, Exploration, Oil industry, Fisheries, Recreation.
Identifiers: *Sanctuaries, Outer Continental Shelf, Coastal Zone Management, Ocean dumping.

This report has been prepared primarily with the intent of providing the participants in the Workshop on Sanctuaries with background information on the issue of marine and estuarine sanctuaries. It is also intended to present a series of concepts as to what might constitute marine or estuarine sanctuaries. A brief review is presented of legislative history, other programs, and various concepts as to what constitutes or should constitute marine and estuarine sanctuaries. Although one goal of the workshop is some consensus relative to sanctuaries, another goal is the clear exposition of partisan views in context with other either supporting or opposing views. Information is given on various governmental and private programs. Legitimate uses of the coastal zone are summarized. This workshop will provide the Department of Commerce with much of the information base needed for them to establish the policy of the Federal Government with regard to the sanctuary provisions of Public Law 92-532 and Public Law 92-583. (NOAA)
W77-00888

INFLUENCE OF THE SUPRAMOLECULAR MARINE ENVIRONMENT ON PITTING CORROSION,
Texas A and M Univ., College Station. Ocean Engineering Program.
For primary bibliographic entry see Field 8G.
W77-00890

REGULATION OF COASTAL ZONE DEVELOPMENT FOR FISHERIES MANAGEMENT,
Alabama Dept. of Conservation and Natural Resources, Montgomery.
For primary bibliographic entry see Field 6B.
W77-00891

THE SOCIAL AND ECONOMIC IMPORTANCE OF THE CARONI SWAMP IN TRINIDAD AND TOBAGO,
Michigan Univ., Ann Arbor. Dept. of Natural Resources.
For primary bibliographic entry see Field 6G.
W77-00893

MARINE POLLUTION ARTICLES IN THE LAW OF THE SEA SINGLE INFORMAL NEGOTIATING TEXT,
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 5G.
W77-00894

COASTAL ENGINEERING DATA NETWORK,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. J. Seymour, M. H. Sessions, S. L. Wald, and A. E. Woods.
Sea Grant Publication 50; IMR Reference 76-11, July 1976. 129 p, 24 fig, 4 ref, append. SG-04-6-158-44021.

Descriptors: *California, *Sediment transport, *Data processing, *Erosion, *Ocean waves, Waves(Water), Climates, Networks, Seasonal.
Identifiers: *Wave energy, *Coastal wave climate, Seasonal trends.

A low cost system for automatically measuring and recording coastal wave data is being operated on a prototype basis. It utilizes standard dial up telephone lines to connect remotely located bottom mounted pressure sensors to a central station. The central station is run by a programmed minicomputer to automatically call each remote station in sequence, and take a continuous record of water pressure fluctuations versus time for approximately twenty minutes. These data are recorded on magnetic tape for processing by the same computer system. Periodically, data are processed and significant wave height, and energy versus period, computed. Currently four stations are being monitored over a thirty-seven mile length of Southern California coastline. Sites are located off the ends of established piers which provide suitable power, telephone connections, and bridge the surf zone. (NOAA)
W77-00898

DESIGN LIMITS ON CRITICAL FLOAT EMERGENCE IN A TETHERED FLOAT BREAKWATER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 8C.
W77-00899

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 1. MARINE MAMMALS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00901

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 2, MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00902

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 3. MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00903

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 4. MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00904

ENVIRONMENTAL ASSESSMENT OF TH ALASKAN CONTINENTAL SHELF. VOLUME FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administr tion, Boulder, Colo. Environmental Research La
For primary bibliographic entry see Field 6G.
W77-00905

ENVIRONMENTAL ASSESSMENT OF TH ALASKAN CONTINENTAL SHELF. VOLUME FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administr tion, Boulder, Colo. Environmental Researc Labs.
For primary bibliographic entry see Field 6G.
W77-00906

ENVIRONMENTAL ASSESSMENT OF TH ALASKAN CONTINENTAL SHELF. VOLUME FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administr tion, Boulder, Colo. Environmental Researc Labs.
For primary bibliographic entry see Field 6G.
W77-00907

ENVIRONMENTAL ASSESSMENT OF TH ALASKAN CONTINENTAL SHELF. VOLUM 8, EFFECTS OF CONTAMINANTS.
National Oceanic and Atmospheric Administr tion, Boulder, Colo. Environmental Researc Labs.
For primary bibliographic entry see Field 6G.
W77-00908

ENVIRONMENTAL ASSESSMENT OF TH ALASKAN CONTINENTAL SHELF. VOLUME CHEMISTRY AND MICROBIOLOGY.
National Oceanic and Atmospheric Administr tion, Boulder, Colo. Environmental Researc Labs.
For primary bibliographic entry see Field 6G.
W77-00909

ENVIRONMENTAL ASSESSMENT OF TH ALASKAN CONTINENTAL SHELF. VOLUM 10. CHEMISTRY AND MICROBIOLOGY.
National Oceanic and Atmospheric Administr tion, Boulder, Colo. Environmental Researc Labs.
For primary bibliographic entry see Field 6G.
W77-00910

ENVIRONMENTAL ASSESSMENT OF TH ALASKAN CONTINENTAL SHELF. VOLUM II. PHYSICAL OCEANOGRAPHY AN METEOROLOGY.
National Oceanic and Atmospheric Administr tion, Boulder, Colo. Environmental Research La
For primary bibliographic entry see Field 6G.
W77-00911

ENVIRONMENTAL ASSESSMENT OF TH ALASKAN CONTINENTAL SHELF. VOLUM 12. GEOLOGY.
National Oceanic and Atmospheric Administr tion, Boulder, Colo. Environmental Research La
For primary bibliographic entry see Field 6G.
W77-00912

ENVIRONMENTAL ASSESSMENT OF TH ALASKAN CONTINENTAL SHELF. VOLUM 13. GEOLOGY.
National Oceanic and Atmospheric Administr tion, Boulder, Colo. Environmental Research La
For primary bibliographic entry see Field 6G.
W77-00913

VIRONMENTAL ASSESSMENT OF THE ASKAN CONTINENTAL SHELF. VOLUME ICE.
tional Oceanic and Atmospheric Administra-n, Boulder, Colo. Environmental Research Lab.
r primary bibliographic entry see Field 6G.
7-00914

E SHRIMP FISHERY OF THE SOUTH AT-NTIC UNITED STATES: A REGIONAL ANAGEMENT PLAN.
uth Carolina Wildlife and Marine Resources pt., Charleston. Marine Resources Center.
r primary bibliographic entry see Field 6B.
7-00918

E INTERNATIONAL LAW OF THE SEA: A SE FOR A CUSTOMARY APPROACH,
uth Carolina Univ., Columbia. School of Marine ence.
r primary bibliographic entry see Field 6E.
7-00956

LAGIC TAR,
r primary bibliographic entry see Field 5B.
7-00969

DEL FOR A STUDY,
ny Engineer District, Baltimore, Md.
E. Robinson, Jr., and J. H. McKay.
ter Spectrum, Vol 5, No 3, p 19-26 (1973). 8 p, photo.

scriptors: *Chesapeake Bay, *Hydraulic dels, *Bodies of water, *Estuaries, *Model stu-s, Currents(Water), Fluid mechanics, Hydrau-engineering, Hydraulic similitude, Hydraulics, oratory tests, Testing, Hydraulic design, aryland, Federal government, Grants.

esapeake Bay is beginning to feel the effects of h human intrusion and natural forces. Spread-algae, wind and wave erosion, and pollution only a few of the problems that must be faced. order to meet these problems, Congress horized the construction of a hydraulic model Chesapeake Bay. Federal and State agencies university scientists are working on the nning and construction. When finished, it will the largest and most complete model ever built, ering nine and a half acres. It will accurately roduce the vertical and lateral distributions of rent velocity, salinity, and tidal elevation. A 12-r and 25-minute tidal cycle can be reproduced the model in about 7.5 minutes, and a one-year ing period can be reproduced in a little over e and a half days. The model is expected to e in advance problems of drilling, dredge a..d oil and waste pollution, saltwater en-achment, and waste heat. This hydraulic del, when used in conjunction with both lytical and field studies, will greatly assist er resource planners in developing responsible nagement programs for the Bay. (Frank-rida)
7-00971

OTECTION OF THE MARINE ENVIRON-NT FROM POLLUTION,
primary bibliographic entry see Field 5G.
7-00973

WER FROM THE SEA,
primary bibliographic entry see Field 3E.
7-00977

E SELLING OF THE SHELF,
primary bibliographic entry see Field 5G.
7-00979

DECISION TO LEASE OUTER CONTINENTAL SHELF LANDS,
Massachusetts Energy Policy Office, Boston.
For primary bibliographic entry see Field 6E.
W77-00981

SHORELINE EROSION: IMPLICATIONS FOR PUBLIC RIGHTS AND PRIVATE OWNERSHIP,
For primary bibliographic entry see Field 6E.
W77-00982

O'BRIEN V BARNES BUILDING COMPANY (DEFINITION OF TIDAL WETLANDS).
For primary bibliographic entry see Field 6E.
W77-01016

SHIGELLA RESEARCH IN THE SEA AND IN AN ESTUARY: I. FREQUENCY OF BACTERIOPHAGES IN POLLUTED WATER, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 5B.
W77-01020

SHIGELLA RESEARCH IN THE SEA AND IN AN ESTUARY: II. ATTEMPT TO INHIBIT THE ADSORPTION OF SHIGAPHAGES AND STUDIES OF SHIGELLA ON A SELECTIVE MEDIUM, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 5B.
W77-01021

SHIGELLA RESEARCH IN THE SEA AND IN AN ESTUARY: III. IN VITRO DETERMINATION OF THE SURVIVAL TIME OF SHIGELLA SONNEI YCD IN SEA WATER, (IN FRENCH),
Inst. R. Sci. Nat. Belg., Bruxelles, Belg. Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 5B.
W77-01022

A COMPARISON OF BENTHIC COMMUNITIES OF STRUJNJAN AND KOPER BAYS WITH REGARD TO THEIR DIFFERING EXPOSURE TO POLLUTION STRESS, (IN SLOVENIAN),
Ljubljana Univ. (Yugoslavia). Morska Biologijo Postaja.
For primary bibliographic entry see Field 5C.
W77-01024

GROWTH AND PRODUCTION OF MASS SPECIES OF CHIRONOMIDS (DIPTERA, TENDIPEDIDAE) IN THE VOLGA PRE-DELTA, (IN RUSSIAN),
Kaspiiski Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 5C.
W77-01025

LIPID TRANSFORMATION IN SEAWATER BY OIL-OXIDIZING MICROORGANISMS, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR). Dept. of Marine Sanitation Hydrobiology.
For primary bibliographic entry see Field 5A.
W77-01030

ENZYMATIC IN SITU MEASUREMENTS: NEW SEAWATER AND SEDIMENT MEASUREMENT METHODS, (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskude.
For primary bibliographic entry see Field 5A.
W77-01031

DISTRIBUTION AND SIGNIFICANCE OF FECAL INDICATOR ORGANISMS IN THE UPPER CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-01061

SEASONAL SHIFTS IN THE SPAWNING SITE OF A NORTHEAST PACIFIC INTERTIDAL FISH,
British Columbia Univ., Vancouver, B. C. Inst. of Animal Resource Ecology.
J. B. Marliave.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 10, October 1975, p 1687-1691, 3 fig, 1 tab, 7 ref.

Descriptors: Environmental effects, *Fish, *Spawning, Temperature, Seasonal, Waves(Water), On-site investigations, *Pacific Ocean, Intertidal areas.
Identifiers: *Black prickleback, Xiphister atropurpureus.

Spawning sites of the black prickleback, Xiphister atropurpureus, were studied. Shifts in spawning sites during the winter and spring spawning periods were observed. This species selects underboulder substrates of shells, pebbles, and small rocks that provide spaces most nearly matching the cross-sectional body size of the adults for spawning sites. Spawning occurs under such a wide range of water temperatures from December to May that slight temperature variations between sites could not solely account for differences. The seasonal shift probably results because wave action decreases as temperatures increase during the spring. (Chilton-ORNL)
W77-01063

SEASONAL DISTRIBUTIONS OF LARVAL FLATFISHES (PLEURONECTIFORMES) ON THE CONTINENTAL SHELF BETWEEN CAPE COD, MASSACHUSETTS, AND CAPE LOOKOUT, NORTH CAROLINA, 1965-66,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Lab.; and National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center.
W. G. Smith, J. D. Sibunka, and A. Wells.
NOAA Technical Report NMFS SSRF-691, June 1975. 68 p, 72 fig, 16 tab, 44 ref.

Descriptors: *Reproduction, *Spawning, *Seasonal, *Distribution patterns, Fish, Larvae, Eggs, Temperature, On-site investigations, Continental shelf, Atlantic Ocean.
Identifiers: Bothids, Pleuronectids, Cynoglossids, *Flatfish.

In a survey designed to locate spawning grounds and trace dispersion of fish eggs and larvae on the continental shelf, 4 families, 17 genera, and 15 species of fish were studied. The usual time of spawning was in the spring during seasonal temperature changes. Bothids have longer spawning seasons than pleuronectids, beginning in spring and continuing through early fall, in the southern half of the study area. Pleuronectids spawned in the spring in the northern half of the survey area. Cynoglossids spawned incidentally off North Carolina but most of their larvae were transported into the study area from spawning grounds south of Cape Lookout. Onset of spawning was triggered by spring warming and fall cooling with most species spawning within a relatively narrow range of temperatures. (Chilton-ORNL)
W77-01064

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS AS AN ADVANCED TREATMENT PROCESS,
Ontario Ministry of the Environment, Thunder Bay.
For primary bibliographic entry see Field 5D.
W77-00607

ECONOMICS OF A FREEZE DESALTING PROCESS USING COLD SEAWATER EFFLUENT OF A LIQUID NATURAL GAS PLANT.
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 272, Price codes: A04 in paper copy, A01 in microfiche. Office of Water Research and Technology, Final Report OWRT/S-76/52, March 1976. 46 p, 20 fig, 2 tab. 14-30-3313.

Descriptors: *Desalination, *Freezing, *Capital costs, Cost estimates, Sea water, *Desalination processes.
Identifiers: Secondary refrigerant, Liquid natural gas, Crystalex process, *Freeze desalting process.

Process flow diagrams of the AVCO 'Crystalex' freeze desalting process and of the modified processes when using cold seawater effluent from the liquid natural gas plant are presented. The lower feed temperature makes it possible to reject heat at a lower temperature and reduces refrigerant compressor work. Budget estimates indicate that the water costs could be reduced up to 18 percent for the AVCO process when cold seawater at 33 degrees F from the liquid natural gas plant is used. Detailed water and capital costs are presented. (OWRT)
W77-00635

3B. Water Yield Improvement

WATER RESOURCE AUGMENTATION IN THE SOUTHWEST.
In: Energy, Water, and the West, November 2-5, 1975, Albuquerque, p 47-52, May 1976. 5 append.

Descriptors: *Water resources development, *Southwest US, *Weather modification, *Snowpacks, Water sources, Water supply, Water importing, Land tenure, Legal aspects.
Identifiers: *Colorado River Basin Project Act, *Winter orographic snowpack augmentation.

Among the provisions of the Colorado River Basin Project Act passed by Congress in 1968 was one which forbade the Interior Secretary from studying or recommending water importation from areas of surplus without approval of the states involved. Although this moratorium ends in 1978, there won't be water available for exportation to the Southwest at that time. Most of the western states' watersheds are on federal land, and over two-thirds of the total land area of these states is federally owned. Legal conflicts are especially serious in the Northwest where water is more plentiful and the rights of use are in dispute. A study of winter orographic snowpack augmentation in the Upper Colorado River Basin is cited as a means of weather modification for water resource enhancement. This process involves increasing winter precipitation by seeding moisture-laden air masses pushed by prevailing winds over high mountain ranges, after which moisture is extracted by natural processes. The weather modification technique and its effects are described. Social impacts are discussed along with recommendations for the establishment of policies to govern weather modification and associated water resources development. (See also W77-00542) (Jahns-Arizona)
W77-00546

EFFECT OF PRESCRIBED BURNING ON SEDIMENT, WATER YIELD, AND WATER QUALITY FROM DOZED JUNIPER LANDS IN CENTRAL TEXAS,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
For primary bibliographic entry see Field 4C.
W77-00679

WATER USE ON RANGELANDS,
Geological Survey, Denver, Colo.
F. A. Branson.
Reprint from Watershed Management on Range and Forest Lands; Proceedings of the Fifth Workshop of the United States/Australia Rangelands Panel, June 15-22, 1975, Boise, Idaho, p 193-209, March 1976. 27 fig, 1 tab, 68 ref.

Descriptors: *Water conservation, *Watershed management, *Evapotranspiration, *Soil-water-plant relationships, *Range management, Water users, Water harvesting, Water spreading, Runoff.
Identifiers: *Soil moisture stress, *Internal-plant stress.

Literature is reviewed and some previously unpublished information is presented for the following topics: (1) vegetation as related to precipitation and runoff, (2) vegetation-water-soil relationships, (3) water harvesting, (4) range water spreaders, and(5) water management on rangelands. Evapotranspiration quantities, often over 90 percent of precipitation that reaches rangelands, is reported for a number of plant communities. Internal-plant stress is related to many environmental variables but correlates most highly with lowest soil-moisture stress in the soil profile. Relative drought tolerance of plant species is indicated by maximal seasonal internal-plant stresses. The highest internal-plant stress measured was 117 bars for Atriplex nuttallii. Evapotranspiration estimates based on soil-moisture measurements were significantly correlated with maximum seasonal plant stress, bare soil, and percent live plant growth. In terms of plant growth, water use efficiency was lower for plants occupying dry sites than for plant of moist sites. Ancient and modern methods of harvesting water from artificial or modified watersheds are discussed. (Woodard-USGS)
W77-00846

AVAILABILITY OF GROUND WATER IN THE AREA SURROUNDING THE TRIDENT SUBMARINE CONSTRUCTION FACILITY, KITSAP COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4B.
W77-00862

CHARACTERISTICS OF THE MAIN COMPONENTS OF WATER BALANCE OF SANDY DESERT PLANT COMMUNITIES, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Biogeography.
For primary bibliographic entry see Field 2I.
W77-00882

3C. Use Of Water Of Impaired Quality

MIGRATION OF SALT FROM FEEDLOT WASTE AS AFFECTED BY MOISTURE REGIME AND AGGREGATE SIZE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W77-00558

IRRIGATION OF CORN WITH SIMULAT MUNICIPAL SEWAGE EFFLUENT,
Michigan State Univ., East Lansing. Agricult Experiment Station; and Michigan State Un East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5E.
W77-00610

WASTEWATER IRRIGATION - THE PRICE RIGHT,
Santa Rosa Public Works, Calif.
For primary bibliographic entry see Field 5D.
W77-00613

3D. Conservation In Domestic an Municipal Use

URBAN SEDIMENT PROBLEMS: A STA MENT ON SCOPE, RESEARCH, LEGIS TION, AND EDUCATION.
American Society of Civil Engineers, New Y Task Committee on Urban Sedimenta Problems.
For primary bibliographic entry see Field 5B.
W77-00556

COMPUTERIZED CITY-WIDE CONTROL URBAN STORMWATER,
Colorado State Univ., Fort Collins. Dept. of C Engineering.
For primary bibliographic entry see Field 5G.
W77-00634

URBAN FLOOD WARNING AND WATERSH MANAGEMENT ADVANCES METROPOLITAN MELBOURNE,
Melbourne and Metropolitan Board of Wo (Australia).
For primary bibliographic entry see Field 6F.
W77-00670

PLANNING FOR STORM WATER MANA MENT,
Watkins (G. Reynolds) Consulting Engineers, I Lexington, Ky.
For primary bibliographic entry see Field 6F.
W77-00770

PROGRAM SPECIFICATION FOR THE SEW AND WATER ACCOUNTS PROCESSI MODULE - READING USAC PROJECT.
For primary bibliographic entry see Field 5G.
W77-00773

EVALUATION OF ALTERNATIVE METHO OF SUPPLEMENTAL RECHARGE BY STOR WATER BASINS ON LONG ISLAND, NE YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4B.
W77-00853

3E. Conservation In Industry

ENERGY, WATER, AND THE WEST,
American Association for the Advancement Science, Washington, D. C.
For primary bibliographic entry see Field 6D.
W77-00542

VIEWS FROM THE ENERGY INDUSTRIES.
For primary bibliographic entry see Field 6D.
W77-00548

NWATER-INTENSIVE ENERGY
OURCES.
primary bibliographic entry see Field 6D.
-00549

ATING WASTE DISCHARGE LIQUIDS
M METAL HARDENING BATHS, PAR-
ULARLY CONTAINING NITRITE AND
RATE COMPOUNDS,
primary bibliographic entry see Field 5D.
-00693

CESS FOR THE TREATMENT OF WASTE
TER FROM A FIBERGLASS MANUFAC-
ING PROCESS,
hem Products, Inc., Ambler, Pa. (Assignee).
primary bibliographic entry see Field 5D.
-00695

PATTERNS FOR DEPLETABLE AND
YCLEABLE RESOURCES,
F. Kennedy School of Government, Cam-
ge, Mass.
primary bibliographic entry see Field 6C.
-00708

ODEL OF RECYCLING AND POLLUTION
NTROL,
ida Univ., Gainesville. Dept. of Economics.
primary bibliographic entry see Field 5G.
-00711

IFICATION OF INDUSTRIAL WASTE
TER - HAVING HIGH CONCENTRATION
DISSOLVED SOLIDS BY TREATMENT
H STRONG ACIDS OR BASES TO GIVE
TILISERS AND FEED ADDITIVES.
primary bibliographic entry see Field 5D.
-00743

OVAL AND RECOVERY OF CYANIDE
ZINC FROM ELECTROPLATING
STES BY SOLVENT EXTRACTION,
Ridge National Lab., Tenn.
primary bibliographic entry see Field 5D.
-00747

GE-SCALE EFFLUENT TREATMENT IN
DYESTUFFS INDUSTRY.
primary bibliographic entry see Field 5D.
-00758

LAIMING WATER,
primary bibliographic entry see Field 5D.
-00759

OVAL OF ORGANICS FROM WATER,
nutit-Boby, Ltd., London (England).
primary bibliographic entry see Field 5D.
-00924

OXIFYING INDUSTRIAL WASTEWATERS.
primary bibliographic entry see Field 5D.
-00965

VER FROM THE SEA,
wann.
ironment, Vol 18, No 4, p 25-40 May 1976. 16
ig, 5 photo, 3 dwg, 3 tab.

criptors: *Thermal power, *Thermal power
ts, *Tropical regions, *Electrical power
uction, *Differential thermal analysis, Ther-
studies, Thermal water, Efficiencies, Cost
parisons, Engineering structures, Environ-
al effects, Cost analysis, Heat exchangers,
mal properties, Oceans, Sea water, Resource
lopment, Temperature, Heat.

Identifiers: *Sea thermal power.

Researchers have estimated that sea thermal power is capable of providing 200 times the earth's present total power needs. Sea thermal power is produced by using heat engines to harness temperature differentials between surface and depths of tropical seas. It is also a renewable energy source which is replenished daily by solar radiation. Since surface temperatures of tropical seas never falls below 78 degrees F., plants can operate on a constant basis. This eliminates the need for expensive storage and retrieval systems. Diagrams are presented to demonstrate the sea thermal power generating cycle and an electricity generating unit. Cost factors, production techniques, environmental effects, and world impact are also discussed. (Reinders-Florida)
W77-00977

3F. Conservation In Agriculture

ECONOMIC AND WATER USE IMPACTS ASSOCIATED WITH ALTERNATIVE WATER PRICING POLICIES OF ESTABLISHED IRRIGATION DISTRICTS,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6C.
W77-00672

GROWN ORGANIC MATTER AS A FUEL RAW MATERIAL RESOURCE,
Ohio Agricultural Research and Development Center, Wooster.
W. L. Roller, H. M. Keener, R. D. Kline, H. J. Mederski, and R. B. Curry.
Report NASA CR-2608, October 1975. 132 p. 12 fig., 18 tab., 83 ref., 7 append. NGL-36-007-001.

Descriptors: *Fuels, *Organic matter, *Agriculture, *Feasibility studies, Energy conversion, Bibliographies, Crop production, Photosynthesis, Plant breeding, Costs, Biomass, Fertilizers.
Identifiers: Energy supplements.

In an analysis based on an extended literature search on biomass production, only doubtful feasibility was found for producing grown organic matter for fuel in competition with food, feed and fiber on U.S. acreages. The analysis considered biomass production, production alternatives, and the production of fuel from crop residues. In the search, 169 sources were annotated in eight topical areas: (1) biomass production of specific crops, 37 sources; (2) climatic effects data, 6 sources; (3) cultural practices effects on crop production, 38 sources; (4) input/output data, 29 sources; (5) multiple species production, 8 sources; (6) photosynthetic efficiency, 10 sources; (7) auxiliary information, 21 sources; (8) summarization, 20 sources. Information was evaluated according to costs and energy needs for biomass production among many plant species. Consideration was given to anticipated water needs, nutrient requirements and the effects of climate. Costs and energy estimates were made in a simulated analysis of projected systems of biomass production, using conventional production methods for six species with high production potential. In contrast with other studies on biomass production possibilities, no assumption was made that conditions can be made favorable for maximum production at minimum input costs. (Harris-Wisconsin)
W77-00700

ARTIFICIAL RECHARGE IN THE GRAND PRAIRIE, ARKANSAS,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W77-00734

A STUDY OF THE RECURRENCE OF RAINFALL DEFICIENCY IN RELATION TO RICE CROP,
Indian Agricultural Research Inst., New Delhi.
P. N. Bhargava, P. Narain, and A. Pradhan.
Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J 8(3/4), p 206-209, 1974.

Descriptors: *Rice, *Crops production, *Rainfall disposition, Growth rates.

Rainfall in July and Sept. has pronounced effect on rice yield. These months are crucial months involving the growth of the crop, flowering and seed formation period. The chance of occurrence of deficient rain in these months was of the order of 28% and 22%, respectively. The deficient rainfall in the months of July and Sept. is expected to recur on an average of every 4th and 5th yr.--Copyright 1976, Biological Abstracts, Inc.
W77-00746

THERMAL DISTURBANCES OF WHEAT WATER METABOLISM IN MODELS OF NATURAL METEOROLOGICAL COMPLEXES, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Soil Sciences and Agrochemistry.
V. F. Al'Tergot, and S. S. Mordkovich.
Dokl Akad Nauk SSR Ser Biol 220(2), p 482-484, 1975.

Descriptors: *Wheat, *Metabolism, *Transpiration, Droughts, Irrigation, Model studies, Moisture content, Meteorology.
Identifiers: USSR.

The results of a study of the water content, transpiration rate and water retention of the 4th leaf of wheat cultivars Saratovskaya 29' (drought-resistant) and 'Minskaya' (drought-susceptible) under conditions simulating natural meteorological complexes are presented. 'Northern drought', an analog of drought in the Northwest of the USSR; 'dry heat', an analog of the sukhovei (dry wind) on irrigated fields; and 'moist heat', an analog of windless, hot weather on irrigated fields were studies.--Copyright 1976, Biological Abstracts, Inc.
W77-00755

PRODUCTION INVESTIGATIONS IN IRRIGATED AND NON-IRRIGATED WINTER WHEAT STAND DURING THE GROWING SEASON, (IN HUNGARIAN),
University of Agriculture, Godollo (Hungary).
A. Kovacs, and Z. Gaspar.
Novenytermeles 24(2), p 149-157, 1975.

Descriptors: *Wheat, *Crop production, *Irrigation, Growth rates, Sampling, Seasonal.
Identifiers: Phenophase, Winter wheat.

The effect of irrigation on phytomass production was followed in a well overwintered winter wheat (cultivar, 'Kavkaz') stand. The aboveground phytomass and the root mass by 5 cm levels were measured by phenophases (by samplings). The aboveground phytomass showed significant differences in the dynamics of development due to irrigation treatment, until the late May sampling. Due to a decline in water supply, the dry matter production decreased from flowering to ripening. This break did not show in the non-irrigated treatment where there remained a moderate tendency to increase all along.--Copyright 1976, Biological Abstracts, Inc.
W77-00963

CENTER PIVOT IRRIGATION,
W. Splinter.
Scientific American, Vol 234, No 6, p 90-99, June 1976. 10 p, 6 photo, 1 chart.

Descriptors: *Water demand, *Irrigation efficiency, *Irrigation engineering, *Irrigation practices,

Irrigation programs, Irrigation water, Irrigation wells, Distribution systems, Land development, Water distribution(Applied), Evapotranspiration, Leaching, Crop response, Crop production, Distribution patterns, Irrigation.
Identifiers: *Center-pivot irrigation.

Irrigation practices have not changed much in recent decades. However, the recent introduction of center-pivot irrigation is having noticeable impact. Mechanically, center-pivot irrigation involves a structured pipe system emanating from a central pivot to a length of up to one mile. Water is released at pre-planned rates and places, depending on the size and nature of the crop. Center-pivot systems are being rapidly adopted, primarily because of their automatic operation, ability to control application rate and frequency, and their easy accommodation to rolling terrain. Central-pivot have some drawbacks, however, including large, local water source requirements, and large electrical peak load periods. Development costs are approximately $350 per acre. Overall, the system's potential for widespread use seems unlimited. (Frank-Florida)
W77-00968

EFFECT OF SOIL MOISTURE ON DELIVERY OF NITROGEN-15 TO WINTER WHEAT PLANTS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
For primary bibliographic entry see Field 2G.
W77-01035

IRRIGATION WITHOUT WASTES,
K. Shea.
Environment, Vol 17, No 5, p 12-15, July/August 1975. 4 p, 1 photo, 7 ref.

Descriptors: *Irrigation, *Irrigation design, *Irrigation efficiency, *Irrigation systems, *Irrigation engineering, Water distribution(Applied), Crop response, Drainage effects, Farm management, Irrigated land, Water control, Distribution systems, Sprinkler irrigation, Furrow irrigation.
Identifiers: *Isreal.

Even though the creation of large pumping stations and concretelined canals have allowed irrigation systems to become more massive, all systems still rely on gravity for distributing needed water. Unfortunately, the oldest and most widely used irrigation method, flood irrigation, is also the most wasteful and environmentally damaging. Israel has pioneered in creating the drip, or trickle, irrigation system. Studies have shown that it is particularly useful for specialty crops, such as fruit. It consists of a head connected to a main water supply and includes filters, valves, couplings, water meter, pressure gauge, and sometimes connections for injecting fertilizers. Conducting pipes and distribution tubes carry water down the rows. To these are attached emitters that can be adjusted to release water at rates varying from one to six liters per hour. Drip irrigation uses roughly one-third to one-half the quantity of water used in sprinkle and furrow irrigation. It can be used on all types of terrain, the interrow spaces are not watered, fewer weeds grow, and dollar savings are considerable. Major problems yet to be resolved include high cost, clogging and salt buildup. (Frank-Florida)
W77-01047

ARK-MO FARMS, INC. V. UNITED STATES (PROBLEM OF PROOF IN RECOVERING FOR FLOOD DAMAGE TO CROPS).
530 F2d 1384-87 (Ct Cl 1976). 4 p.

Descriptors: *Judicial decisions, *Dams, *Flood damage, *Crop production, *Hydrologic aspects, Hydrologic systems, Damages, Dam design, Hydrologic data, Economics, Risks, Governments, Discharge(Water), Jurisdiction, Negligence, Penalties(Legal), Water law, Arkansas.
Identifiers: *Dam effects, *Intentional torts, *Proximate causation, *Arkansas River.

Plaintiff owner of a 10,000 acre farm on the Arkansas River sued for damage to crops allegedly caused by the closing of a government dam. The suit failed for lack of proof of causation. The flooding allegedly was the consequence of the closing of Dam No. 2 of the McClellan-Kerr Arkansas River Navigation System, a multi-purpose project primarily created to provide a navigation channel. The project includes a number of flood control structures. Detailed and unchallenged hydrological data showed that the project had in fact decreased peaks, duration, and frequency of floods. Nevertheless, in absence of proof that the closing of the dam was the cause of the floods complained of, plaintiff could not recover. (Reinders-Florida)
W77-01050

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

TECHNOLOGY ASSESSMENT FOR NEW WATER DEVELOPMENT PROJECTS, (VOLUME I),
Virodyne Corp., Littleton, Colo.
For primary bibliographic entry see Field 6B.
W77-00527

SYSTEMATIC APPROACH TO WATER RESOURCES PLAN FORMULATION.
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-00532

ROLE OF PARTIAL GRADIENT ESTIMATION BY SIMULATION IN WATER RESOURCE PLAN FORMULATION, PART I,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-00533

A SEARCH TECHNIQUE FOR FORMULATING IMPROVED WATER RESOURCES CONFIGURATIONS, PART II,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-00534

SCREENING MODELS IN WATER RESOURCES PLANNING, PART III,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-00535

WATER RESOURCES IN THE WESTERN STATES: PROGRAM POLICY INITIATIVES.
For primary bibliographic entry see Field 6D.
W77-00547

MUNICIPAL WATERSHED MANAGEMENT SURVEY,
Southeastern Area State and Private Forestry, Atlanta, Ga.; and Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W77-00608

LIST OF PAPERS, 1967/1975 (INTERNATIONAL ASSOCIATION FOR HYDRAULIC RESEARCH).
International Association for Hydraulic Research, Delft (Netherlands).
For primary bibliographic entry see Field 10C.
W77-00636

MODELING OF NONCONTINUOUS FOR UNION AND MESAVERDE SANDSTON RESERVOIRS, PICEANCE BASI NORTHWESTERN COLORADO,
For primary bibliographic entry see Field 4B.
W77-00637

A STABLE ESTIMATOR FOR LINEA MODELS: 2. REAL WORLD HYDROLOGIC A PLICATIONS,
Pavia Univ. (Italy).
For primary bibliographic entry see Field 2E.
W77-00640

AN INEXPENSIVE THERMISTOR FLOWM TER FOR AQUATIC BIOLOGY,
Duke Univ., Durham, N. C. Dept. of Zoology.
For primary bibliographic entry see Field 7B.
W77-00645

SEASONAL SNOW ACCUMULATION, MEL AND WATER INPUT--A NEW ENGLAN MODEL,
Agricultural Research Service, University Par Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W77-00646

IMPROVING THE QUALITY OF WATE RELEASES FROM RESERVOIRS BY MEA OF A LARGE DIAMETER PUMP,
Oklahoma State Univ., Stillwater. Dept. Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-00668

THE PARTICIPATION OF NEW YORK CO MUNITIES IN THE FEDERAL FLOOD I SURANCE PROGRAM,
Cornell Univ. Agricultural Experiment Statio Ithaca, N.Y. Dept. of Rural Sociology.
For primary bibliographic entry see Field 6F.
W77-00671

A TALE OF TWO CITIES: FLOOD HISTO AND THE PROPHETIC PAST OF RAPID CIT
Waikato Univ., Hamilton (New Zealand).
For primary bibliographic entry see Field 6F.
W77-00706

THE BIOLOGICAL CONTROL OF ALLIG TORWEED,
Agricultural Research Service, Gainesville, F Biological Control Lab.
For primary bibliographic entry see Field 5G.
W77-00714

CROWN STRUCTURE AND DISTRIBUTION BIOMASS IN A LODGEPOLE PINE STAND,
Forest Service (USDA), Fort Collins, Colo. Roc Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2I.
W77-00729

THE ENVIRONMENTAL IMPACT OF LARGE TROPICAL RESERVOIR: GUIDELIN FOR POLICY AND PLANNING. BASED UP A CASE STUDY OF LAKE VOLTA, GHANA, 1973 AND 1974,
Smithsonian Institution, Washington, D. C.
For primary bibliographic entry see Field 6G.

7-00767

ANNING FOR STORM WATER MANAGE-NT,
tkins (G. Reynolds) Consulting Engineers, Inc., ington, Ky.
primary bibliographic entry see Field 6F.
7-00770

NTRACTING FOR SOCIAL IMPACT AS-SSMENT,
primary bibliographic entry see Field 6G.
7-00771

REPORT TO THE NEW ENGLAND RIVER SIN COMMISSION ON OUTDOOR RECREA-ON WITH APPLICATION TO THE SUPPLE-NTAL FLOOD MANAGEMENT STUDY OF E COMPREHENSIVE WATER AND RE-TED LAND RESOURCES INVESTIGATION THE CONNECTICUT RIVER BASIN. PART RECREATION,
eau of Outdoor Recreation, Philadelphia, Pa. rtheast Regional Office.
primary bibliographic entry see Field 6B.
7-00772

IDE PLAN REPORT, ANDROSCOGGIN ER BASIN, MAINE AND NEW MPSHIRE, REGIONAL AND INTERSTATE ERVIEW.
w England River Basins Commission, Boston, ss.
primary bibliographic entry see Field 6B.
7-00774

SERVOIR SEDIMENTATION ASSOCIATED TH CATCHMENT ATTRIBUTES, LAND-DE POTENTIAL, GEOLOGIC FAULT, AND L CHARACTERISTICS,
est Service (USDA), Berkeley, Calif. Pacific thwest Forest and Range Experiment Station.
primary bibliographic entry see Field 2J.
7-00779

TRENCHMENT OF DRAINAGE SYSTEMS WESTERN IOWA AND NORTHWESTERN SSOURI,
icultural Research Service, Columbia, Mo.
primary bibliographic entry see Field 2J.
7-00831

ANNEL CHANGES PRODUCED BY THE 3 FLOOD ON THE LOWER MISSISSIPPI ER,
ny Engineer District, Vicksburg, Miss. amology Section.
primary bibliographic entry see Field 2J.
7-00833

TER USE ON RANGELANDS,
logical Survey, Denver, Colo.
primary bibliographic entry see Field 3B.
7-00846

FACE WATER SUPPLY OF THE UNITED TES, 1966-70: PART II. PACIFIC SLOPE INS IN CALIFORNIA--VOLUME 2. BASINS OM ARROYO GRANDE TO OREGON TE LINE EXCEPT CENTRAL VALLEY.
logical Survey, Reston, Va.
primary bibliographic entry see Field 7C.
7-00857

TORY OF IRRIGATION AND CHARAC-RISTICS OF STREAMFLOW IN NEBRASKA RT OF THE NORTH AND SOUTH PLATTE ER BASINS,
logical Survey, Lincoln, Nebr.

For primary bibliographic entry see Field 2E.
W77-00859

EFFECT OF SEQUENCE LENGTH N ON THE CHOICE OF ASSUMED DISTRIBUTION OF FLOODS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W77-00861

WATER RESOURCES OF THE WARM SPRINGS INDIAN RESERVATION, OREGON,
Geological Survey Portland, Oreg.
J. H. Robison, and A. Laenen.
Water-Resources Investigations 76-26, 1976. 85 p, 32 fig, 1 plate, 17 tab, 30 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, Data collections, Aquifer characteristics, Hydrogeology, Water wells, Water yield, Streamflow, Flow rates, Lakes, Chemical analysis, Water utilization, *Oregon.
Identifiers: *Warm Springs Indian Reservation(Oreg).

Water-resources data for the 1,000-square-mile Warm Springs Indian Reservation in north-central Oregon were obtained and evaluated. The area is bounded on the west by the crest of the Cascade Range and on the south and east by the Metolius and Deschutes Rivers. The mountainous western part is underlain by young volcanic rocks, and the plateaus and valleys of the eastern part are underlain by basalt, tuff, sand, and gravel of Tertiary and Quaternary ages. There are numerous springs, some developed for stock use, and about 50 domestic and community wells; yields are small, ranging from less than 1 to as much as 25 gallons per minute. Chemical quality of most ground water is suitable for stock or human consumption and for irrigation. Average flows of the Warm Springs River, Metolius River, and Deschutes River are 440, 1,400, and 4,040 cubic feet per second (cfs), respectively. Shitike Creek, which has an average flow of 108 cfs had a peak of 4,000 cfs in January 1974. Most streams have fewer than 100 milligrams per liter (mg/liter) of dissolved solids. Chemical and biological quality of the mountain lakes is also good; of 10 lakes studied, all had fewer than 50 mg/liter of dissolved solids and none had measurable fecal coliform bacteria. (Woodard-USGS)
W77-00864

EFFECTS OF CHANGES IN AN ALLUVIAL CHANNEL ON THE TIMING, MAGNITUDE, AND TRANSFORMATION OF FLOOD WAVES, SOUTHEASTERN ARIZONA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2E.
W77-00869

FLOOD-PLAIN DELINEATION FOR CAMERON RUN BASIN, FAIRFAX COUNTY--ALEXANDRIA CITY, VIRGINIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W77-00870

FLOOD PLAIN MANAGEMENT ALTERNATIVES IN THE MAITLAND AREA (AUSTRALIA),
New South Wales Univ., Kensington (Australia).
G. M. Folie, R. Henderson, D. T. Howell, and G. D. McColl.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 1-4, June 1976. 4 ref.

Descriptors: *Flood plains, *Flood control, *Non-structural alternatives, *Australia, Flood plain zoning, Flood plain insurance, Land use, Planning, Regional development, Cost-benefit analysis.
Identifiers: *Flood plain management, Maitland(N.S.W.), Hunter River(N.S.W.).

A flood plain management system is described which has been progressively developed over the last twenty years by the New South Wales Public Works Department on the Hunter River in the vicinity of Maitland. The system is a combination of structural and non-structural measures including spillways, floodways, levee banks and flood plain zoning. The system is still being developed with the non-structural measures being refined. All the measures so far included are reviewed, and the system is evaluated in terms of economic efficiency, regional economic impact, environmental impact, and social well-being, and alternatives are considered. The future possible inclusion of flood plain insurance is discussed. Future possibilities in other flood plain management systems are reviewed in the light of the performance of this system. (CSIRO)
W77-00932

DEVELOPMENT OF FLOOD PLAIN MANAGEMENT FOR FORT COLLINS, COLORADO - A CASE STUDY OF U.S. PRACTICE,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
D. H. Pilgrim, and R. A. Burns.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 5 - 9, June 1976. 11 ref.

Descriptors: *Flood plain zoning, *Flood plain insurance, *Flood protection, *Colorado, Flood plains, Non-structural alternatives, River basin development, Planning, *Australia.
Identifiers: *Fort Collins(Colo), *Flood plain management.

Development of flood plain regulations for Fort Collins, Colorado, is described as a case study of the practical application of the national programme of flood plain management that has been developed in the U.S. over the last ten years. Hydrological, hydraulic and mapping studies are outlined, and features of the regulations described. Problems encountered and approaches used in development and implementation of the regulations are emphasised. The role of public participation is discussed. The experience of communities such as Fort Collins should provide considerable help in the development of flood mitigation programmes in Australia. (CSIRO)
W77-00933

FLOOD MITIGATION STRATEGIES: THE ROLE OF INSURANCE AND STRUCTURAL MEASURES,
New South Wales Dept. of Agriculture, Sydney (Australia).
For primary bibliographic entry see Field 6F.
W77-00934

FLOOD STANDARDS - THE ROLE OF ENGINEERING INSTITUTIONS,
Binnie and Partners, Melbourne (Australia).
For primary bibliographic entry see Field 6F.
W77-00935

FREQUENCY ANALYSIS OF FLOOD DATA IN QUEENSLAND (AUSTRALIA),
Department of Primary Industries, Brisbane (Australia).
R. A. Kopittke, B. J. Stewart, and K. S. Tickle.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 20 - 24, June 1976. 1 fig., 10 tab, 9 ref.

Descriptors: *Flood frequency, *Frequency analysis, Distribution patterns, Flood forecasting, *Australia.
Identifiers: *Queensland.

Flood frequency distributions are tested for their goodness-of-fit and prediction abilities. The normal, Pearson, log-Pearson, Boughton empirical, Gumbel, log-Gumbel, Potter, log-Potter, and Weibull distributions were fitted to the annual series of flood discharges for 42 gauging stations situated mainly in eastern Queensland. Goodness-of-fit tests were applied. The data were split in half on an alternate year basis, and the various distributions applied to the halves. Prediction tests (accuracy and consistency) were then applied to these distributions. All of the results are presented in tabular form. Analysis of the results showed that the log-Pearson and the Boughton empirical distributions gave the best overall results. (CSIRO)
W77-00936

WATER RESOURCE EVALUATION USING PHOTOGRAMMETRIC AND REMOTE SENSING TECHNIQUES,
Laurie, Montgomerie and Pettit Ltd., Sydney (Australia).
P. R. Pettit.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 25 - 29, June 1976. 1 fig., 3 tab, 6 ref.

Descriptors: *Remote sensing, *Photogrammetry, *Satellites(Artificial), Mapping, Water resources, Flood plains.

Various airborne remote sensing techniques are described. The use of conventional photography, frequently enhanced by the use of natural or false colour for interpretive and photogrammetric purposes, will continue to be the principal remote sensing method used in water resources evaluation. The development of satellites, such as LANDSAT, which cover the earth's surface on a regular, repetitive pattern recording a variety of features, will become of increasing importance. The multi-band imagery produced may be used to present pictorial display or, alternatively, may be analysed using computer techniques. Satellites also provide a useful means of collecting and transmitting information from a large number of ground-based stations. Techniques used in flood plain mapping are emphasised. (CSIRO)
W77-00937

STATISTICS: WHEN WILL WE EVER LEARN,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Water Resources Branch.
For primary bibliographic entry see Field 7C.
W77-00938

COMPARISON OF SYSTEMS AND PHYSICAL HYDROLOGY APPROACHES TO HYDROLOGIC MODELLING,
Wollongong Univ. Coll. (Australia).
For primary bibliographic entry see Field 2A.
W77-00939

A REGIONAL STORMWATER DRAINAGE MODEL,
A. G. Goyen, and A. P. Aitken.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 40 - 44, June 1976. 2 fig., 10 ref.

Descriptors: *Mathematical models, *Storm drains, *Flood routing, *Urban drainage, Rainfall-runoff relationships, Urban hydrology, Urban runoff, Storm runoff, Flood plains.

A model is presented which analyses trunk stormwater systems involving retarding basins, natural storages and natural or artificial channels and pipes for a given storm situation. The model employs a modification of Laurenson's Runoff Routing Model for hydrograph estimation in urban and partly urbanised catchments, a modified version of the Muskingum-Cunge method for channel routing and Pul's method for the level pool routing of flood flows through storages. Hydrographs, water levels within basins, flow velocities and inundation periods are computed at defined points within the catchment. Sufficient data are available from the model to define flood plain reservations. (CSIRO)
W77-00940

THE MATHEMATICAL MODELLING OF RIVERS,
Meteorology Bureau, Brisbane (Australia). Hydrometeorology Section.
For primary bibliographic entry see Field 2E.
W77-00941

FLOOD ENVELOPES AND FREQUENCIES FOR THE BRISBANE RIVER (AUSTRALIA),
Brisbane City Council (Australia). Dept. of Water Supply and Sewerage.
G. Cossins.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 50 - 55, June 1976. 10 fig., 1 tab., 8 ref.

Descriptors: *Flood frequency, *Flood flow, *Model studies, *Australia, Flood plains, Flood data, Flood forecasting, Warning systems, Urban hydrology, Water levels, Cities.
Identifiers: *Brisbane River(Qld.), Brisbane(Qld.), Flood plain management, Flood plain mapping.

As part of a joint Federal, State and Local Government project to establish models for evaluating the economics of flood plain management and flood mitigation schemes for the metropolitan reaches of the Brisbane River, envelopes of the maximum levels attained were simulated for the whole range of damage-producing floods for which corresponding frequencies were also derived. The data collected, the derivation methods employed, and the application of envelopes and frequency distributions to flood plain mapping, flood warning systems and the economics of flood plain management are described. (CSIRO)
W77-00942

A STAGE-DAMAGE CURVE FOR THE BRISBANE RIVER (AUSTRALIA),
Snowy Mountains Engineering Corp., Cooma (Australia).
A. P. Aitken.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 56 - 60, June 1976. 2 fig., 3 tab., 6 ref.

Descriptors: *Flood damage, *Flood stages, *Data collections, Cost-benefit analysis, Flood control, Warning systems, Flood plains, Buildings, *Australia.
Identifiers: *Brisbane River(Qld.), Flood stage-damage curves.

Cost-benefit studies for flood mitigation schemes and flood forecasting systems require an estimate of the river stage-damage curve. The method used to derive this curve for the Brisbane River using data from the January 1974 flood is described. A particular feature of the study was the compilation of a data bank of buildings affected by floods from the Brisbane River. The data bank consisted of essential data describing the location, size and level of over 28,000 buildings. (CSIRO)
W77-00943

OPTIMIZING BENEFITS TO URBAN RESIDENTS OF A TOTAL FLOOD WARNING SYSTEM FOR THE BRISBANE VALL (AUSTRALIA),
Bureau of Meteorology, Brisbane (Austral Hydrometeorology Section.
G. Heatherwick, and A. L. Quinnell.
In: Hydrology Symposium, Sydney, Austra 1976. The Institution of Engineers Austra Preprints of Papers, p. 61 - 66, June 1976. 2 fig tab., 19 ref.

Descriptors: *Cost-benefit analysis, *Warn systems, *Flood damage, *Cities, *Austra Flood protection, Flood control, Flood frequer Operating costs, Social aspects.
Identifiers: *Brisbane River(Qld.), Brisbane(Q Ipswich(Qld.)

A flood warning system in the Brisbane Valley the cities of Brisbane and Ipswich is develo using a systems model approach and studie detail, with particular reference to major c ponents of the system and their functions and r tionships. All of the above have an effect on public response, which is the prime object warning system. A cost-benefit ratio has b determined for the system from the analysi stage-damage, flood frequency and annual op tion cost data. (CSIRO)
W77-00944

CASE STUDY OF EFFECT OF INCREASED BANISATION ON FLOOD DAMAGE FOR M GILL CREEK, BRISBANE (AUSTRALIA),
New South Wales Univ., Kensington (Australi
For primary bibliographic entry see Field 4C.
W77-00945

HYDROLOGY OF FLOOD MITIGATION M SURES IN THE PAHANG RIVER BA MALAYSIA - A CASE STUDY,
W. J. Scott, F. M. J. Ribeny, and T. J. Fricke.
In: Hydrology Symposium, Sydney, Austr 1976. The Institution of Engineers Austr Preprints of Papers, p. 73 - 77, June 1976. 3 fig ref.

Descriptors: *Large watersh *Instrumentation, *Model studies, *Flood pla Tropical regions, Asia, Regional developm River regulation, Land use, Hydrologic data.
Identifiers: *Malaysia(Pahang River), *Flood p mapping.

The hydrological investigations associated wi large river basin study are described. Estab ment and operation of rainfall, streamflow water level stations was carried out. Analysi existing and collected data provided inputs to assessment of flood mitigation works both river regulation and land use strategies. Catchn modelling on annual, monthly and daily bases carried out using various techniques. Floodp mapping to a scale of 1:10,000 was completed a 3000 sq km area. (CSIRO)
W77-00946

BENEFIT-COST STUDIES IN THE PAHA RIVER BASIN STUDY (MALAYSIA),
L. R. Brownhall, P. Cassell, and G. G. O'Lough
In: Hydrology Symposium, Sydney, Austr 1976. The Institution of Engineers Austr Preprints of Papers, p. 78 - 82, June 1976. 4 fi ref.

Descriptors: *Cost-benefit analysis, *Flood tection, *Flood damage, *Computer models, T ical regions, Asia, Crops, Rice, Horticult crops, Cities, Data collections.
Identifiers: *Malaysia(Pahang River), Rub plantations.

Benefit-cost studies carried out during a stud flooding in the Pahang River Basin in Penins Malaysia during 1974-4 are described. These clude the collection of flood damage data and

ion of expected future damages, derivation of
nage relationships for padi rice, rubber and hor-
ltural crops, studies for urban areas and the
elopment of a computer flood damage simula-
model. The recommendations of the study are
lined. (CSIRO)
7-00947

ATISTICAL SENSITIVITY OF PARAME-
RS IN A RAINFALL-RUNOFF MODEL,
nash Univ., Clayton (Australia). Dept. of Civil
gineering.
primary bibliographic entry see Field 2A.
7-00948

VELOPMENT OF A CONTINUOUS URBAN
INFALL-RUNOFF MODEL,
nash Univ., Clayton (Australia).
primary bibliographic entry see Field 2A.
7-00949

NEMATIC WAVE THEORY APPLIED TO
ORMFLOW FROM A MOUNTAIN
TCHMENT,
bourne and Metropolitan Board of Works
stralia).
primary bibliographic entry see Field 4C.
7-00950

E APPLICATION OF THE SACRAMENTO
INFALL MODEL TO A LARGE ARID
TCHMENT IN WESTERN AUSTRALIA,
wy Mountains Engineering Corp., Cooma
stralia).
primary bibliographic entry see Field 2A.
7-00951

ORM RUNOFF ROUTING TO A TIDAL OUT-
LL: A CASE STUDY,
Rich, B. J. Leplastrier, and E. S. Webber.
Hydrology Symposium, Sydney, Australia,
5. The Institution of Engineers Australia,
prints of Papers, p. 103 - 107, June 1976. 6 fig.,
b., 12 ref.

criptors: *Storm drains, *Flood routing, *Tidal
ers, *Design criteria, *Outlets, *Australia,
an drainage, Storm runoff, Unit hydrographs,
inage systems, Water level fluctuations, Open
nnel flow, Water storage, Cities, Bays.
ntifiers: *Botany Bay(NSW), Sydney(NSW).

eshore reclamation at Botany Bay, Sydney
stralia) involved extending two unformed
n stormwater drains to a tidal outfall through a
bined channel. The design was required to
imise backwater flooding in low-lying land im-
iately upstream of the existing outlets. Sub-
hment input hydrographs were prepared for
ous storm durations using temporal rainfall
ribution, and the hydrographs were routed
ugh the channel system using an open channel
sient flow programme, based on the method of
racteristics, which allowed for relative tem-
l variation between the various input hydro-
hs and the tide cycle. The results facilitated
nomic design by identifying critical sections of
channel system. Channel storage effects were
d to be significant; and the use of temporal
fall patterns was found to give higher hydro-
h peaks than the use of uniform rainfall inten-
particularly for longer duration storms.
IRO)
-00952

'ENVIRONMENTAL' APPROACH TO
RMWATER MANAGEMENT IN THE ADE-
DE HILLS (AUSTRALIA),
h Australian Inst. of Tech., Adelaide.
Argue.
Hydrology Symposium, Sydney, Australia,
. The Institution of Engineers Australia,
Preprints of Papers, p. 108 - 112, June 1976. 3 fig., 14 ref.

Descriptors: *Urban drainage, *Suburban areas, *Design criteria, *Australia, Storm runoff, Urbanization, Storm water, Retention.
Identifiers: *Adelaide Hills(SA).

The establishment of urban subdivisions creates increased flooding and erosion of natural channels downstream: this problem is solved, conventionally, by straightening, widening or lining such channels. A less costly and more environmentally acceptable solution is to control runoff within subdivisions so that peak outflowing discharges differ little from those prior to development. This approach, using retention basins for temporary storage of stormwater, is examined for the case of urban subdivisions in the Adelaide hills. The study presents technical information which simplifies the joint tasks of site selection and preliminary design of the retention basins. (CSIRO)
W77-00953

THE NATION'S INCREASING VULNERABILITY TO FLOOD CATASTROPHE,
For primary bibliographic entry see Field 6F.
W77-00961

FLOODPLAIN MANAGEMENT: THE IOWA EXPERIENCE,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 6F.
W77-00962

THE HEAT BALANCE IN THE FOREST-STEPPE MESOPHILIC DECIDUOUS HIGH OAK FOREST 'LES NA VORSKLE' UNDER ABNORMAL WEATHER CONDITIONS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2I.
W77-00964

WIND EROSION OF SAND AND MEASURES FOR RECLAMATION IN THE ZONE OF THE KARA KUM CANAL, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 4D.
W77-00970

PIANC,
National Water Resources Association, Washington, D. C.
For primary bibliographic entry see Field 6E.
W77-00976

BOUNDARIES OF ARID REGIONS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 7C.
W77-01032

ANTHROPOGENIC MORPHOGENESIS OF THE RELIEF OF THE LOWER DON, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
For primary bibliographic entry see Field 2H.
W77-01039

ARK-MO FARMS, INC. V. UNITED STATES (PROBLEM OF PROOF IN RECOVERING FOR FLOOD DAMAGE TO CROPS).
For primary bibliographic entry see Field 3F.
W77-01050

4B. Groundwater Management

HYGIENIC PROBLEMS OF THE FORMATION AND PREDICTION OF CHANGES OF GROUNDWATER QUALITY IN THE CASE OF RECHARGING FROM SURFACE WATER SOURCES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W77-00528

INFILTRATION LAGOONS FOR TERTIARY TREATMENT OF STABILIZATION POND EFFLUENT,
South Dakota State University, Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-00540

WATER ZONING - TOOL FOR GROUNDWATER BASIN MANAGERS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 6F.
W77-00552

PHYSICAL FUNDAMENTALS OF THE MIXING OF SOLUTIONS OF POLLUTANTS AND SEWAGE IN POROUS MEDIA,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.h., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie.
For primary bibliographic entry see Field 5B.
W77-00554

ITERATIVE METHOD OF DETERMINING AQUIFER CONSTANTS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-00555

EVALUATING POLLUTION-PRONE STRATA BENEATH SEWAGE LAGOONS,
For primary bibliographic entry see Field 5D.
W77-00599

WASTEWATER RECLAMATION PROJECT, ST. CROIX, U.S. VIRGIN ISLANDS,
Black, Crow and Eidsness, Inc. Gainesville, Fla.
For primary bibliographic entry see Field 5D.
W77-00630

MODELING OF NONCONTINUOUS FORT UNION AND MESAVERDE SANDSTONE RESERVOIRS, PICEANCE BASIN, NORTHWESTERN COLORADO,
C. F. Knutson.
Society of Petroleum Engineers Journal, Vol. 16, No. 4, p 175-188, August 1976. 17 fig, 7 tab, 27 ref, 2 append.

Descriptors: *Model studies, *Natural gas, *Colorado, *Rocky Mountain region, Permeability, Oil reservoirs, Hydrofracturing, Fossil fuel, Sandstones, Deep wells, Statistical models, Drillers logs, Well spacing.
Identifiers: *Random models, *Fort Union sandstone, *Mesaverde sandstone, Channel fill deposits, Point bar deposits, Well stimulation, Length-width-thickness ratios.

A recent Federal Power Commission study indicated up to 600 trillion ft of natural gas in place in the Rocky Mountains in low-permeability Cretaceous and Tertiary nonmarine sandstones. This type of reservoir rock was studied in the surface and subsurface in the Piceance Basin area of northwestern Colorado. The sandstone geometry and orientation were characterized. A 'random in-

tersection' technique was developed that used the geological information to generate a spectrum of reservoir models that may be used to simulate the performance of conventional as well as hydraulically and nuclearly fractured wells. Example reservoir models for fractured wells were compared with reservoir models for nonfractured wells. In general, point-bar sandstones could be simulated by radialmodels and channel-fill sandstones by linear models. In a sequence of channel-fill sandstone with Piceance Basin geometry, an average well was connected to about 18% of the in-place reservoir volume in a 320-acre area. Connected reservoir volumes of greater than 70% in a 320-acre area were calculated for fractured wells with fracture wing dimensions of 2000 ft, with actual values depending on fracture extent and pervasiveness. The percent of connected reservoir volume decreased as well spacing increased. (Visocky-ISWS)
W77-00637

PARAMETER IDENTIFICATION IN AN INHOMOGENEOUS MEDIUM WITH THE FINITE-ELEMENT METHOD,
California Univ., Los Angeles.
For primary bibliographic entry see Field 2F.
W77-00638

HYDROGEOPHYSICAL EQUIVALENCE OF WATER SALINITY, POROSITY AND MATRIX CONDUCTION IN ARENACEOUS AQUIFERS,
National Physical Research Lab., Pretoria (South Africa). Geophysics Div.
For primary bibliographic entry see Field 2F.
W77-00652

ARTIFICIAL RECHARGE IN THE GRAND PRAIRIE, ARKANSAS,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
C. L. Griffis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 610, Price codes: A02 in paper copy, A01 in microfiche. Agricultural Experiment Station, Fayetteville, Bulletin 810, August 1976. 7 p, 3 fig, 5 tab, 7 ref. OWRT A-020-ARK(2).

Descriptors: *Artificial recharge, Bench scale studies, Runoff, Polyelectrolytes, *Arkansas, Rice, Water supply, Groundwater movement, Water wells, *Water treatment.
Identifiers: Grand Prairie(Ark).

The Grand Prairie is located in east-central Arkansas between the White River and Bayou Meto. The area is primarily agricultural, with rice being one of the major crops. This rice requires a considerable amount (22 inches) of water each year, and most of the water for this purpose is pumped from underground wells. As a result, the supply of water in the water-bearing strata underground is being depleted faster than it is being replaced. For this reason, some means of artificially replinishing the water in the aquifer is needed. Bench-scale tests showed that a sand-filled, gravity-flow recharge well was not suitable for recharging untreated runoff water in the Grand Prairie. A series of studies then was made to search for a low-cost water treatment system. The water treatment techniques studied included the use of alum, cationic and anionic polyelectrolytes, lime, and magnesium hydroxide. In addition, some studies included combinations of two or more of the chemicals, and in one series of tests the sludge formed in one batch of treated water was used as seed material for the next batch. No treatment method was able to clarify the water for a cost less than the target cost of $5 per acre foot. Other sources for recharge water were examined and the most likely candidates were found to be the drainage water from flooded rice fields, and rainwater collected on the fields during the off-season for rice production. Use of the first water source presents problems. The latter possibility is now under study.
W77-00734

WATER RESOURCES OF THE ROCK RIVER WATERSHED, SOUTHWESTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-00848

WATER RESOURCES OF THE ROOT RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-00849

GEOHYDROLOGY OF THE LOWLAND LAKES AREA, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W77-00850

GEOHYDROLOGY AND WATER SUPPLY, SHEYMA ISLAND, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W77-00851

EVALUATION OF ALTERNATIVE METHODS OF SUPPLEMENTAL RECHARGE BY STORM-WATER BASINS ON LONG ISLAND, NEW YORK,
Geological Survey, Albany, N.Y.
D. A. Aronson.
Open-file report 76-470, 1976. 56 p, 9 fig, 4 tab, 23 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Reclaimed water, *Storm runoff, *Pit recharge, Methodology, Infiltration, Numerical analysis, Model studies, Design storm, Controlled drainage, Evaluation, *New York, Alternative water use.
Identifiers: *Long Island(NY), Dual-purpose basins.

Many of the more than 2,200 storm-water basins on Long Island, N.Y., having runoff and infiltration characteristics similar to those of a basin studied in North Massapequa are potential sites for returning large volumes of reclaimed water (highly treated waste water) to the ground-water reservoir. By use of a finite-difference method of calculation, formulas were devised to calculate changes in basin storage at various time intervals from the start of storm inflow, with and without addition of reclaimed water. The North Massapequa storm-water basin was the prototype design used to test several methods of water application. Calculations using various infiltration rates, storm durations, and storm-return periods indicate that several methods of applying reclaimed water to storm-water basins on Long Island would be feasible. (Woodard-USGS)
W77-00853

GROUND-WATER LEVELS AND WELL RECORDS FOR DISCONTINUED OBSERVATION WELLS IN IDAHO, 1915-72: PART A,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-00854

GROUND-WATER LEVELS AND WELL RECORDS FOR DISCONTINUED OBSERVATION WELLS IN IDAHO, 1915-72: PART B,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-00855

GROUND-WATER LEVELS AND W RECORDS FOR DISCONTINUED OBSE TION WELLS IN IDAHO, 1915-72: PART C,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-00856

AVAILABILITY OF GROUND WATER IN AREA SURROUNDING THE TRIDENT MARINE CONSTRUCTION FACILITY, KI COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
A. J. Hansen, Jr., and D. Molenaar.
Open-File Report 76-351, 1976. 30 p, 15 fig, 5

Descriptors: *Water resources, *Ground availability, *Water demand, *Potential supply, *Aquifer characteristics, Constru Sites, Surface waters, Hydrologic data, water intrusion.
Identifiers: *Kitsap County(Wash), Pre-con tion survey.

General information is presented on resources--with emphasis on ground-water rence and availability--in that part of Kitsap ty (referred to as Trident Impact Area) that be most affected by the development o Trident submarine construction facility at Ba Washington. The estimated 1970 water use study area averaged about 13 million gallo day (mgd); of this amount about 9 mgd came surface-water sources--from a large reservoi side the study area--and about 4 mgd came ground water pumped from two aquifers area. Anticipated water use soon will be ab to 21 mgd; virtually all the additional qu required (about 5 to 8 mgd) above present us come from ground-water sources. Prelim evaluation of the aquifers suggests that an tional 1.5 mgd can be developed from the aquifer and 7 mgd from the lower aquifer. E wells tapping the lower aquifer might yield tional water and increase the total yield in th by 3.5 mgd, and new wells drilled in selected could produce an additional 3.5 mgd fro aquifer. However, additional, large-scale g water withdrawal from the lower aquifer co duce saltwater intrusion into wells situa coastal areas. (Woodard-USGS)
W77-00862

MODEL ANALYSIS OF EFFECTS ON W LEVELS AT INDIANA DUNES NATI LAKESHORE CAUSED BY CONSTRUC DEWATERING,
Geological Survey, Indianapolis, Ind.
J. R. Marie.
Available from the National Technical Inf tion Service, Springfield, VA 22161 as P 908/As, Price codes: A03 in paper copy, microfiche. Water-Resources Investigations July 1976. 32 p, 19 fig, 1 tab, 7 ref.

Descriptors: *Computer models, *Dewa *Groundwater, *Drawdown, *Surface-g water relationships, Aquifer character Water levels, Ponds, Baseline studies, Co tion, Excavation Nuclear powerplants, Sites
Identifiers: *Indiana Dunes National Lake Pond-level declines.

The computer models were developed vestigate possible hydrologic effects within diana Dunes National Lakeshore caus planned dewatering at the adjacent Bailly N Generator construction site. The model a indicated that the planned dewatering would a drawdown of about 4 ft under the weste pond of the Lakeshore and that this dra would cause the pond to go almost dry--le 0.5 ft of water remaining in about 1 percent pond--under average conditions during t month dewatering period. When water lev below average, as during late July and ear gust 1974, the pond would go dry in ab

nonths. However, the pond may not have to go completely dry to damage the ecosystem. If the National Park Service's independent study determines the minimum pond level at which ecosystem damage would be minimized, the models leveloped in this study could be used to predict he hydrologic conditions necessary to maintain hat level. (Woodard-USGS)
W77-00863

WATER RESOURCES OF THE WARM SPRINGS INDIAN RESERVATION, OREGON,
Geological Survey Portland, Oreg.
For primary bibliographic entry see Field 4A.
W77-00864

COMPUTER SIMULATION MODEL OF THE PLEISTOCENE VALLEYFILL AQUIFER IN SOUTHWESTERN ESSEX AND SOUTHEASTERN MORRIS COUNTIES, NEW JERSEY,
Geological Survey, Trenton, N. J.
For primary bibliographic entry see Field 2F.
W77-00865

GEOLOGY AND GROUND-WATER RESOURCES OF CAMDEN COUNTY, NEW JERSEY,
Geological Survey, Trenton, N. J.
For primary bibliographic entry see Field 2F.
W77-00866

INVESTIGATIONS INTO THE VERTICAL DISTRIBUTION OF ORGANISMS AND CHEMICAL SUBSTANCES IN THE GROUNDWATER IN VALLEYS AND TERRACES: METHODS AND FIRST RESULTS, (IN GERMAN),
Max-Planck-Institut fuer Limnologische Schlitz (West Germany). Limnologische Flusstation.
For primary bibliographic entry see Field 5A.
W77-00919

SANITARY AND HYGIENIC EVALUATION OF THE QUALITY OF UNDERGROUND DRINKING WATER, (IN RUSSIAN),
Municipal Sanitary Epidemiology Station, Zhukovskii (USSR)
For primary bibliographic entry see Field 5B.
W77-01023

4C. Effects On Water Of Man's Non-Water Activities

THE IMPACT OF PROPOSED FEDERAL ENERGY DEVELOPMENT ON WESTERN WATER RESOURCES,
In: Energy, Water, and the West,November 2-5, 1975, Albuquerque, p 11-17, May 1976. 5 append.

Descriptors: *Energy, *Future planning(Projected), *Water resources development, *Water requirements, Coals, Oil shales, Human population, Water users, Water demand.
Identifiers: *Western U. S.

Two authors report on projected federal energy development in the west and the impact of energy decision on water use in that region. Almost half of the nation's known coal reserves lie in the western states, with about 60% under federal jurisdiction. Western coal is attractive because of its low sulfur content and easier access in many locations. Planning and development for this resource and for oil shale are discussed. Water demands for conversion of coal are substantial; some possible water sources and their limitations are outlined. Also discussed are the impacts of growth, especially in small communities unprepared for it, and mitigating environmental impacts. Interior Department policies for total water management, coal exporting and intergovernmental cooperation are presented. The Arab influence on energy problems has been substantial, and energy independence requires drawing on western resources. Approximately 2 million acre-feet a year of new water will be needed in the Northern Great Plains and Colorado Basin by 1985. The key issue may be competition between potential users for available water. Government intervention will probably be necessary to manage some of this uneven economic competition. Recommendations for state and local action are outlined. (See also W77-00542) (Jahns-Arizona)
W77-00543

FEDERAL AND STATE GOVERNMENTS, AND THE INDIAN NATIONS: WATER RIGHTS, CONFLICTS, AND POLICIES,
For primary bibliographic entry see Field 6E.
W77-00544

EFFECT OF PRESCRIBED BURNING ON SEDIMENT, WATER YIELD, AND WATER QUALITY FROM DOZED JUNIPER LANDS IN CENTRAL TEXAS,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
H. A. Wright, F. M. Churchill, and C. S. Stevens.
Journal of Range Management, Vol. 29, No. 4, p 294-298, July, 1976. 2 fig, 4 tab, 32 ref. OWRT C-3191(No 3699)(3), 14-31-0001-3699.

Descriptors: *Sediment discharge, *Water quality, *Runoff, *Turbidity, *Watersheds(Basins), Water management(Applied), Water supply, Seepage, Erosion, Slopes, Burning, *Texas.
Identifiers: *Rainfall frequency, *Rainfall intensity, Central Texas, Limestone-derived soil, *Prescribed burning.

Prescribed burning was applied to six minivatersheds that were each paired with an unburned watershed on limestone-derived soils in Central Texas. Erosion losses, runoff, and water quality were unaffected on level areas, but adverse effects lasted for 9 to 15 months on moderate slopes (8-20%) and for 15 to 30 or more months on steep slopes (37-61%). Soil losses were 1 ton/acre on 15% slopes and 6 to 8 tons/acre on steep slopes. Rates of erosion losses stabilized within 18 months on all slopes when vegetative cover reached 63 to 68%. Quality of water was soft from level areas, moderately hard for 6 months on 15 to 20% slopes, and moderately hard for 15 to 30 or more months on 45 to 53% slopes. Turbidity stayed above the controls for 1 1/2 years on moderate slopes and for 3 to 4 years on steep slopes. Slopes greater than 20% should not be converted from shrubs to grass and left to heal naturally.
W77-00679

THE INFLUENCE OF LAND USE ON STREAM NUTRIENT LEVELS,
Corvallis Environmental Research Lab., Oreg. Eutrophication Survey Branch.
For primary bibliographic entry see Field 5C.
W77-00725

AIRFLOW PATTERNS AND SNOW ACCUMULATION IN A FOREST CLEARING,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
In: Western Snow Conf. (Coronado, Calif., April 1975) Proc. 43, p 106-113.

Descriptors: *Clear-cutting, *Snow management, Snowmelt, Air circulation, *Snowpacks, Watershed management, *Forest management, Water yield improvement, *Lodgepole pine trees.

Snow accumulation and airflow patterns were measured before and after establishing a clearing 1 tree-height wide and 5 tree-heights long in a lodgepole pine forest. The long axis was normal to prevailing wind. The profile of accumulated snow, less the mean amount of snow upwind of the clearing, was compared with the streamline patterns of airflow. Snow profiles are shown for 2 years where annual accumulation varied by a factor of 2. Snow accumulation was maximum in the clearing and minimum just behind the lee clearing edge. The maximum was centered about the upwind edge of the back eddy of airflow in the clearing. The minimum coincided with the downwind edge of the same eddy. These comparisons suggest that clearings may become saturated similar to snowfence systems, and that the accumulation pattern reflects primarily wind drift of falling snow rather than subsequent erosion and redeposition. (Forest Service)
W77-00726

EVALUATING IMPACT OF FOREST SITE PREPARATION ON SOIL AND WATER QUALITY IN THE U.S. GULF COASTAL PLAIN,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 5B.
W77-00740

EFFECT OF LAND USE ON SEDIMENT DELIVERY RATIOS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W77-00777

SEDIMENT YIELD FROM CONSTRUCTION SITES,
MITRE Corp., McLean, Va. Dept. of Environmental Assessment.
R. L. Holberger, and J. B. Truett.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-47 - 1-58, 1976. 1 fig, 3 tab, 16 ref.

Descriptors: *Sediment yield, *Construction, *Model studies, Mathematical studies, Sediments, Erosion, Runoff, Precipitation(Atmospheric), Rainfall, Forecasting, Sediment load, Sediment transport, Soil erosion, Streamflow, Sedimentology.

Two sediment loading functions were fitted to sediment loss data from eight field studies of construction sites. Both were adaptations of the Universal Soil Loss Equation, and involved an empirically-fitted factor to account for effects of intervening terrain between construction site and point of sediment measurement in a nearby watercourse. One function used the distance from the foot of the exposed area to the nearest perrenial stream, while the second function used the percent of the drainage basin undergoing construction. Comparison of predicted sediment yields (in tons/acre) with observed yields indicated that, for the first loading function, about 54% of the predictions fell within a range of + or - 50% of observed values. Approximately 30% of the predictions generated by the second method fell within + or - 50% of the observed values. (See also W77-00775) (Sims-ISWS)
W77-00780

DEBRIS FLOWS FOLLOWING WILDFIRE IN NORTH CENTRAL WASHINGTON,
Forest Service (USDA), Wenatchee, Wash. Pacific Northwest Forest and Range Experiment Station.
G. O. Klock, and J. D. Helvey.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-91 - 1-98, 1976. 1 fig, 4 ref.

Descriptors: *Erosion, *Washington, *Forests, *Forest fires, *Floods, Precipitation(Atmospheric), Precipitation excess, Streams, Streamflow, Flood flow, Wastes, Flash floods, Storm runoff, Sediments, Sedimentation, Alluvial fans, Alluvium, Channels, Channel morphology.
Identifiers: *Debris torrents, *Entiat River, Debris.

A combination of rapid snowmelt, high intensity rainstorms, and fire-denuded watersheds resulted in massive debris torrents from numerous tributary streams of the Entiat River in north-central Washington during the spring and summer of 1972. Debris torrents were summarized by location, soil type, topography, and land use history for five adjacent watersheds. Alternative forest management recommendations were suggested for minimizing the impact of possible future debris torrents within the study area. (See also W77-00775) (Sims-ISWS)
W77-00783

EROSION AND SEDIMENT FROM FOREST LAND USES, MANAGEMENT PRACTICES AND DISTURBANCES IN THE SOUTHEASTERN UNITED STATES,
Forest Service (USDA), Atlanta, Ga. Southeastern Area.
G. E. Dissmeyer.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 1-140 - 1-148, 1976. 1 fig, 5 tab, 2 ref.

Descriptors: *Erosion, *Sediment yield, *Forests, *Southeast U. S., Forest management, Forest watersheds, Forest fires, Sediment discharge, Sediments, Suspended solids, Sedimentation, Water quality, Roads, Grazing, Land use, Storm runoff, Watersheds(Basins).

The data and information presented defines the nature, extent, and magnitude of erosion and sediment sources from several forested river basins in the Southeastern United States. Data showed that not all sediment from forest land is related to silviculture, but in some areas, past abusive agriculture and present woodland overgrazing are the most important sources of sediment. Data also showed that forest practices acts, which contain blanket regulations, are likely to be inappropriate for some areas, insufficient for others, or sometimes unnecessary. It was concluded that control of forest sediment needs to be prescriptive and site specific in nature to meet not only water quality, but other resource needs. (See also W77-00775) (Sims-ISWS)
W77-00787

DEFINING THE SEDIMENT TRAPPING CHARACTERISTICS OF A VEGETATIVE BUFFER. SPECIAL CASE: ROAD EROSION,
Forest Service, Denver, Colo. Rocky Mountain Region.
For primary bibliographic entry see Field 4D.
W77-00799

GEOTECHNICAL MANAGEMENT OF FOREST LANDS IN GRANITIC TERRANE,
Forest Service (USDA), Medford, Oreg. Rogue River National Forest.
B. G. Hicks.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 2-83 - 2-90, 1976. 5 ref.

Descriptors: *Forests, *Forest management, *Lumbering, *Landslides, Rainfall, Erosion, Soil erosion, Road construction, Granites, Weathering, Erosion control, Slopes, Projects, On-site investigations, Mountains.
Identifiers: *Granitic terranes, Granitic rocks.

Weathered granitic rocks have historically created problems for forest land management. Specialists are working to minimize the environmental damage resulting from road construction and logging impacts. Problems result when entry is made into steep granitic terrane with high rainfall where road construction and logging is planned. The damage is largely due to liquefaction type failures which produce greatly accelerated mass wasting as a result of debris landslides and flows. This geotechnical scheme was a unique plan for forest land management which produces a quantitative program for an environmentally safe operation and will yield an economically feasible project. The format of the scheme was: (1) Select a granitic area with stability problems, prepare detailed topographic map and obtain color and color infrared photography. (2) Hydrologic monitoring. (3) Engineering geologic study: mapping, drilling, sampling, geophysical surveys, field testing for stability parameters. (4) Soil engineering: lab and model test representative samples and compute stability parameters. (5) Correlate field properties with lab and model tests. (6) Prepare stability unit map. (7) Develop logging and road construction project using stability map and road design data. (See also W77-00775) (Sims-ISWS)
W77-00800

TECHNIQUES OF RESEARCHING INFORMATION FOR THE DEVELOPMENT OF A MANUAL TO VEGETATE SOILS OF LOW PRODUCTIVITY DISTURBED BY CONSTRUCTION ACTIVITIES,
Midwest Research Inst. Kansas City, Mo.
For primary bibliographic entry see Field 4D.
W77-00805

CONTROL OF TURBIDITY AT CONSTRUCTION SITES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 4D.
W77-00808

NUTRIENTS LOST IN DEBRIS AND RUNOFF WATER FROM A BURNED CHAPARRAL WATERSHED,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
L. F. DeBano, and C. E. Conrad.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 3-13 - 3-27, 1976. 1 fig, 4 tab, 24 ref.

Descriptors: *Nutrient removal, *Runoff, *Erosion, *California, Nutrients, Chaparral, Burning, Slopes, Litter, Watersheds(Basins), Nitrogen, Phosphorus, Calcium, Magnesium, Sodium, Potassium, Chemistry, On-site investigations, laboratory tests, Water quality.
Identifiers: *Prescribed burning, Nutrient loss.

Runoff water and movement of debris were measured on a chaparral-covered watershed, in southern California, that was prescribe-burned in summer 1973. Plant nutrients in the runoff water and debris during the first rainy season were analyzed. The amounts of N, P, Ca, Mg, K, and Na in the soil, litter, and plant material after burning, but before erosion occurred, were measured. In the first year, an area with 50% slopes had about 7300 kg/ha (6300 lb/ac) of material eroded from the plots on the burned sites as compared to only 210 kg/ha (187 lb/ac) on similar unburned sites. On the burned area, less debris was lost from the plots having 20% slopes than from those on steeper sites. No erosion occurred on unburned slopes with a 20% slope. The total amount of nutrients lost in debris and runoff water from the steep slopes that burned, in kg/ha (lb/ac), were: nitrogen—15.1 (13.5); phosphorus—3.4 (3.0); potassium—27 (24.1); magnesium—31.6 (28.2): calcium—67.4 (60.2); and sodium—4.6 (4.1). Nutrients lost represented less than 6% of the total nutrient found in the upper 2 cm (0.79 in) of the soil and litter layer immediately after the fire. (See also W77-00775) (Sims-ISWS)
W77-00810

SEDIMENT RUNOFF DURING HIGHWAY CONSTRUCTION,
Geological Survey, Harrisburg, Pa.
W. G. Weber, Jr., and L. A. Reed.
Reprint from Civil Engineering--ASCE, March 1976: ASCE Irrigation and Specialty Conference in Ottawa, Canada, July 1976. 4 p, 4 fig, 1 tab.

Descriptors: *Sediment control, *Road construction, *Pennsylvania, Highways, Sediment transport, Retaining walls, Ponds, Vegetation, Watersheds(Basins), Erosion control, Methodology, Evaluation.
Identifiers: *Harrisburg area(Pa), Interstate-83, Construction(Pa).

The Pennsylvania Department of Transportation and Environmental Resources (State Conservation Commission) and the U.S. Geological Survey are cooperating in a field study to determine the effectiveness of various erosion-control measures during highway construction on I-81. Hydrologic parameters including water and sediment flow are being monitored in five adjacent watersheds near Harrisburg, Pa. Different types of erosion control measures are being used in each watershed to prevent soil exposed by the construction activity from entering the stream system. The area under active construction correlates well with the sediment load transported by the streams. The onsite holding devices, such as off-stream ponds appear to be the most effective method of sediment control on this project. Seeding and mulching have minor effect on sediment production until vegetative growth is well established. The placing of the subbase had a major effect on sediment production due to the large exposed area involved. (Woodard-USGS)
W77-00847

GEOHYDROLOGY OF THE LOWLAND LAKE AREA, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska
For primary bibliographic entry see Field 7C.
W77-00850

FLOOD-PLAIN DELINEATION FOR CAMERON RUN BASIN, FAIRFAX COUNTY, ALEXANDRIA CITY, VIRGINIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W77-00870

AN ECONOMIC ANALYSIS OF THE ENVIRONMENTAL IMPACT OF HIGHWAY DEICING,
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5C.
W77-00923

CASE STUDY OF EFFECT OF INCREASED URBANISATION ON FLOOD DAMAGE FOR MOOGILL CREEK, BRISBANE (AUSTRALIA),
New South Wales Univ., Kensington (Australia).
C. H. Munro.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 67 - 72, June 1976. 1 tab, 7 ref.

Descriptors: *Urbanisation, *Flood discharge, *Flood damage, *Australia, Suburban areas, Peak discharge.
Identifiers: *Brisbane(Qld.), Moggill Creek(Qld.).

The effect of increased urbanisation of metropolitan suburbs on flood discharges

scussed, and a case study is presented for Mog-
ll Creek, a tributary of the Brisbane River, with
me reference to Breakfast Creek and Kedron
rook. Based on three procedures reported in U.S.
erature, the conclusion of the study is that an in-
ease in urbanisation rendering up to 20% of the
tchment impervious causes only small increases
peak flood discharges, peak flood levels and
erage annual flood damage estimates. The outer
burbs of Brisbane are considered to be such that
is percentage of impervious surface would rarely
exceeded. (CSIRO)
77-00945

INEMATIC WAVE THEORY APPLIED TO TORMFLOW FROM A MOUNTAIN ATCHMENT,
elbourne and Metropolitan Board of Works
ustralia).
. J. Langford.
: Hydrology Symposium, Sydney, Australia,
76. The Institution of Engineers Australia,
eprints of Papers, p. 93 - 97, June 1976. 8 fig., 9
f.

escriptors: *Forest watersheds, *Mathematical
odels, *Rainfall-runoff relationships, *Mountain
rests, Storm runoff, Hydrographs, Streamflow
recasting, Forest management, Clear-Cutting,
egetation effects.
dentifiers: *Kinematic wave theory.

evelopment and preliminary testing of a model,
ased on kinematic wave equations, for calculat-
g stormflow hydrographs for steep mountain
tchments, and particularly to assist in detecting
anges due to clearfelling and other forest opera-
ons, is described. Simplifying assumptions were
ade to reduce the number of parameters to three:
rainfall intensity scale, a constant loss rate, and a
easure of channel conveyance. A system of scal-
g was developed to reduce the amount of compu-
tion characteristic of kinematic wave theory; a
ll set of integrations need only be done for each
vel of loss rate, hydrographs for any combina-
on of the other parameters can be obtained by ad-
sting the distance and streamflow concentration
ales. Calculation of hydrographs for a simple
onstant intensity storm illustrate the basic pro-
erties of the model, and a preliminary test appli-
ation to a hydrograph from an experimental
tchment is described. (CSIRO)
77-00950

IAN'S EFFECT ON THE QUALITY OF OUR VATER,
entral and Southern Florida Control District,
Vest Palm Beach.
or primary bibliographic entry see Field 5C.
77-00974

D. Watershed Protection

RBAN SEDIMENT PROBLEMS: A STATE-IENT ON SCOPE, RESEARCH, LEGISLA-ION, AND EDUCATION.
merican Society of Civil Engineers, New York.
ask Committee on Urban Sedimentation
roblems.
or primary bibliographic entry see Field 5B.
77-00556

IUNICIPAL WATERSHED MANAGEMENT URVEY,
outheastern Area State and Private Forestry, At-
nta, Ga.; and Geological Survey, Atlanta, Ga.
or primary bibliographic entry see Field 5B.
77-00608

WATERSHED MANAGEMENT AND DECI-ION MAKING IN RELATION TO COMPUTER HARDWARE, COMMUNICATIONS AND SOFT-WARE DESIGN),
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 7C.
W77-00619

EFFECT OF PRESCRIBED BURNING ON SEDI-MENT, WATER YIELD, AND WATER QUALI-TY FROM DOZED JUNIPER LANDS IN CEN-TRAL TEXAS,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
For primary bibliographic entry see Field 4C.
W77-00679

A REGIONAL PLANNING APPROACH TO THE FLOODPLAIN MANAGEMENT PROBLEM,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W77-00704

SUBMERGED BURLAP STRIPS AIDED REHA-BILITATION OF DISTURBED SEMIARID SITES IN COLORADO AND NEW MEXICO,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
B. H. Heede.
USDA Forest Service Research Note, RM-302, December 1975. 8 p., 8 fig., 1 tab., 2 ref.

Descriptors: *Erosion control, *Bank stabilization, *Grassed waterways, *Channel improvement, *Flow control, Gully erosion, Rill erosion, Mountain slopes, Ephemeral streams, Colorado, New Mexico, Rocky Mountain region.
Identifiers: Mechanical erosion control, Colorado Rocky Mountains, New Mexico Gila Mountains.

Two planting sites with narrow submerged burlap strips showed 14 times less soil loss than control sites without burlap. Gullies and deep rills need to be reshaped to gentle swales before burlap is installed. Plant cover should become established before burlap disintegrates--about 5 years. (Forest Service)
W77-00727

MOUNTAIN WATERSHEDS AND DYNAMIC EQUILIBRIUM,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
B. H. Heede.
In: Watershed Management. Proceedings of Symposium by Irrigation and Drainage Division, ASCE, August 11-13, 1975, Logan, Utah, p. 407-420, 4 fig., 4 ref.

Descriptors: *Geomorphology, *Watersheds(Basins), *Channel morphology, Streamflow, Ephemeral streams, Perennial streams, Sediment load, *Watershed management, *Equilibrium, Colorado, Rocky Mountain region, Land development.
Identifiers: *Landform development, Channel nickpoints, Dynamic equilibrium, Longitudinal stream profile, Fraser Experimental Forest, Arizona White Mountains.

Watersheds represent an important landform. Knowledge of their stage of development tells about future watershed behavior. This is critical for watershed management because man may enhance or hinder future natural processes. Dynamic characteristics of two perennial and two ephemeral mountain streams revealed that the former are in a state of dynamic equilibrium, while the latter are still working toward its attainment. Bed characteristics indicated that both aim at adjustment to slope by formation of rock and log bars. Thus, the surrounding forest plays an active role in stream hydraulics. (Forest Service)
W77-00728

EVALUATING IMPACT OF FOREST SITE PREPARATION ON SOIL AND WATER QUALI-TY IN THE U.S. GULF COASTAL PLAIN,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 5B.
W77-00740

ENVIRONMENTAL MANAGEMENT IN THE MALIBU WATERSHED: INSTITUTIONAL FRAMEWORK,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 6G.
W77-00769

PROCEEDINGS OF THE THIRD FEDERAL INTER-AGENCY SEDIMENTATION CON-FERENCE 1976.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W77-00775

WATERSHED EROSION MODEL VALIDATION FOR SOUTHWEST IOWA,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
C. A. Onstad, R. F. Piest, and K. E. Saxton.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-22 - 1-34, 1976. 3 fig, 5 tab, 8 ref.

Descriptors: *Erosion, *Watersheds(Basins), *Model studies, *Iowa, Mathematical models, Sediments, Sedimentation, Sediment yield, Soil erosion, Runoff, Rainfall, Precipitation(Atmospheric).

Watershed erosion data from two Agricultural Research Service watersheds near Treynor, Iowa were used to test an erosion model developed by Onstad and Foster. This model utilized a distributed set of input variables and included a detachment and a transport phase. Depending on the magnitude of each phase, soil was either eroded or deposited. Predicted sediment yields from sheet-rill sources were compared with measured yields for single events and with predictions by the universal soil loss equation developed by Wischmeier and Smith and the Williams model. A sensitivity analysis was performed for the fitted parameter in the Onstad-Foster model. Confidence intervals were also calculated for a wide range of single-event sediment yields. These results showed that the Onstad-Foster model performed better than the other two models for the storms tested. (See also W77-00775) (Sims-ISWS)
W77-00778

SEDIMENT SOURCES AND YIELDS FROM SAGEBRUSH RANGELAND WATERSHEDS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
C. W. Johnson, and C. L. Hanson.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-71 - 1-80, 1976. 1 fig, 4 tab, 11 ref.

Descriptors: *Sediment yield, *Runoff, *Ranges, *Watersheds(Basins), *Idaho, Sediments, Suspended solids, Bed load, Bed load samplers, Weirs, On-site investigations, Surveys, Rainfall, Precipitation(Atmospheric), Drainage, Model studies, Mathematical models, Sedimentology.
Identifiers: *Reynolds Creek Watershed(Idaho).

Average sediment yields from the Reynolds Creek Experimental Watershed and three subwatersheds ranged from 1.14 to 1.90 tonnes/ha/year (0.51 to

0.85 tons/ac/year) during the study period. Yields were more than tenfold higher in wet than in dry years, and about 90% of average yearly yield occurred during January, February, and March at the Reynolds Outlet Station. Sediment yields from six upland source areas, 0.9 to 83 ha (2.25 to 205 acres), were one-third or less per unit area than those from larger downstream watersheds. Bedload transport data collected by use of Helley-Smith bedload samplers showed that bedload averaged about 20% of total sediment yield. Analysis of runoff-sediment events by parameter optimization showed excellent correlation between suspended sediment volume and combined peak flow and runoff volume. The procedure should be useful in predicting sediment yields from similar areas having a minimum of sediment data. (See also W77-00775) (Sims-ISWS)
W77-00781

SEDIMENT YIELDS FROM A MISSISSIPPI DELTA WATERSHED,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
C. E. Murphree, C. K. Mutchler, and L. L. McDowell.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-99 - 1-109, 1976. 3 fig, 2 tab, 7 ref.

Descriptors: *Sediment yields, *Runoff, *Farm management, *Mississippi, Rainfall, Precipitation(Atmospheric), Sediments, Clays, Silts, Crops, Cotton, Agriculture, Erosion, Agricultural chemicals, Herbicides, Pollutants, Regression analysis, Soil erosion, Agricultural runoff, Sedimentation.

Runoff and sediment yield were measured on a Mississippi Delta watershed, land-formed to 0.2% slope, and farmed in continuous cotton. Interest in sediment yields and hydrology of the flatland watersheds of the Lower Mississippi River Valley or Delta (as it is commonly known) had increased greatly due, primarily, to the concern that agricultural chemicals may be transported into streams and lakes by sediment and runoff waters from farmlands. However, sediment yields indicated a serious erosion problem; 28.98 MT/ha/year (12.93 tons/acre/year) were lost from a 15.58-ha (38.5-acre) watershed during a 2-year period. Because rainfall in these 2 years was extremely high (33% above the 17-year average), long-term average annual sediment yield values should be lower. (See also W77-00775) (Sims-ISWS)
W77-00784

SIMULATING EROSION DYNAMICS WITH A DETERMINISTIC DISTRIBUTED WATERSHED MODEL,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. E. Smith.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-163 - 1-173, 1976. 5 fig, 15 ref.

Descriptors: *Erosion, *Model studies, *Watersheds(Basins), Mathematical models, Flow, Equations, Streamflow, Precipitation(Atmospheric), Rainfall, Hydraulics, Kinetics, Runoff, Mathematical studies, Suspended solids, Sediments, Sediment yield, Infiltration, Pollutants.
Identifiers: Differential equations.

A simulation model was described which incorporated the differential equation for continuity of suspended sediment into a kinematic numerical model for hydraulic response of a watershed surface. The model was practical since it included an advanced infiltration function and had the ability to accept complex rainfall patterns. The structure of the model allowed the simulation of relatively complex watershed shapes using a watershed composed of small branched channels fed by an arrangement of non-rectangular, converging planes with distorted slopes. The realism of the model's ability to simulate sediment production was limited by the necessity to specify rather empirical functions for soil detachment rates from rainfall impact and from flowing water. It was learned that either tractictive force or stream power function may be chosen as a model for sediment-carrying capacity. Several examples were shown to demonstrate the capabilities of such a dynamic and distributed simulation of watershed sediment production, including effects on erosion of rainfall patterns, slope convergence, and comparative sediment-production rainfall, overland flow, and channel flow. (See also W77-00775) (Sims-ISWS)
W77-00788

SEDIMENTATION OF A FLATLAND WATERSHED IN LOUISIANA,
Soil Conservation Service, Alexandria, La. Watershed Planning and River Basin Studies.
C. R. Akers.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 1-174 - 1-180, 1976. 1 fig, 7 ref.

Descriptors: *Sedimentation, *Watersheds(Basins), *Louisiana, *Mississippi River, Marshes, Levees, Bayous, Runoff, Erosion, Suspended solids, Sediments, Sampling, Rainfall, Simulated rainfall, Soils, Soil erosion, Sheet erosion, Sediment yield, Agricultural runoff, Sedimentology.
Identifiers: *Bayou Fafourche(La).

Recent emphasis on the downstream effects of the Public Law 566 flatland watersheds has created an additional need to examine the various aspects of the sedimentary process in areas of low relief. Presently accepted evaluation procedures were developed in areas of greater relief and generally dealt with coarser soils. The data for evaluation described here was a joint effort between the Agricultural Research Service (ARS), the United States Geological Survey (USGS), and the Soil Conservation Service (SCS). Each group has unique expertise, and the coalition of this expertise is expected to furnish the maximum knowledge in minimum time at minimum expense. Basic sheet erosion was determined by ARS using a 'rainfall simulator.' Sediment in transport was measured by USGS using PS-69 samplers. Rates of sediment deposition were measured by ARS using Cesium-137 concentrations as date markers. SCS monitored activities that affect the land, providing personnel in the immediate area, correllating activities dealing with the study, analyzing results of the various studies, and evaluating the elements of the sedimentary process. (See also W77-00775) (Sims-ISWS)
W77-00789

WATER AND SEDIMENT ROUTING FROM SMALL WATERSHEDS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
R-M. Li, M. A. Stevens, and D. B. Simons.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 1-193 - 1-204, 1976. 5 fig, 5 ref.

Descriptors: *Model studies, *Sampling, *Sediment yield, *Hydrographs, Rainfall, Precipitation(Atmospheric), Runoff, Erosion, Soil erosion, Watersheds(Basins), Sediments, Sedimentation, Infiltration, Sheet erosion, Channel erosion, Mathematical models, Hydraulics, Routing, Storms, Streamflow.

In many past studies, a statistical interpretation o observed data has been utilized to solve sediment yield and related problems. It is difficult to predic the response of a watershed to various lan developments or treatments using these method because they are based on the assumption o homogeneity in time and space. Numerica modelling using equations describing the physica processes is a viable way to study the effects o various watershed treatments or land develop ments on water and sediment yields fro watersheds. The numerical model presented in thi paper simulated the physical processes by whic water and sediment are moved overland to an down creeks and rivers in watersheds. Some of th processes modeled were interception and infiltra tion from rainfall, overland flow from excess rai fall, sediment production due to raindrop impac sheet erosion by overland flow, channel erosio and the water and sediment routing through th channel system. A nonlinear kinematic-wave ap proximation for flow routing was used to rou water and sediment overland and in channels. Fo the watershed simulated, the computed water an sediment yields agreed with the measured wat and sediment yields. In addition, this model ha the capability to predict watershed treatment e fects on individual water and sediment hydr graphs and long-term yields, and to identify th sediment sources in watersheds. (See also W7 00775) (Sims-ISWS)
W77-00790

SOURCES AND SEDIMENT YIELD O HAWAIIAN WATERSHED AND COASTA SEDIMENTS,
Hawaii Univ., Honolulu. Dept. of Geology an Geophysics; and Hawaii Inst. of Geophysics.
For primary bibliographic entry see Field 2J.
W77-00791

THE HYDROLOGIC AND SEDIMEN PROCESSES IN NATURAL WATERSHE AREAS,
Hydrocomp International, Palo Alto, Calif.; an Hydrocomp International, Glasgow (Scotland).
G. Fleming, and K. M. Leytham.
In: Proceedings of the Third Federal Inter-Agenc Sedimentation Conference, 1976; Denve Colorado, March 22-25, 1976. Water Resource Council, Washington, D. C., Sedimentation Con mittee, p 1-232 - 1-246, 1976. 1 fig, 13 ref.

Descriptors: *Sedimentation, *Sediments, *Mod studies, Data collections, Data processin Hydrology, Soil erosion, Rainfall, Runoff, She erosion, Land use.
Identifiers: *Sediment processes.

In a world rather belatedly concerned with ration use of its resources, the understanding, predictio and control of sediment processes is becoming topic of some considerable importance. Sedime may effectively limit the useful life of stora facilities in some parts of the globe and in othe sheet erosion and resulting soil degradation m be fatal to both human life and a nation's viab exstence. Advanced countries and various intern tional agencies must work to develop approach of universal applicability for land use manageme in the widest meaning of the word. The widespre practical application of conceptual sedime models would appear to be limited by serio shortages of basic data. This is true even for sim ple models such as Negev's, although it is hop that sufficient data may be obtainable for its use be viable within the U.S.A. One problem is that this multi-disciplinary subject, data sources a widely scattered, often in obscure places. Th establishment of some control archive for da concerned with land-use activities and manag ment could be of considerable value. Anoth problem which has been recognized in the past the chaotic state of sediment transport study wi its enormous variety of definitions and term units, methods of measurement and a very confu

array of formula and equations which often do explicitly state assumptions of limits of applicability. (See also W77-00775) (Sims-ISWS)
77-00792

MPARATIVE COSTS OF EROSION AND DIMENTATION CONTROL MEASURES,
igation/Agriculture Engineering-Science, Inc., rkeley, Calif.
H. Ateshian.
In: Proceedings of the Third Federal Inter-Agency dimentation Conference, 1976; Denver, lorado, March 22-25, 1976. Water Resources uncil, Washington, D.C. Sedimentation Committee, p 2-13 - 2-23, 1976. 1 fig, 2 tab, 5 ref.

scriptors: *Erosion control, *Sediment control, ost comparisons, *Construction costs, onomics, Soil erosion, Sediments, Sedimentan, Rainfall, Runoff, Control structures, Conuction, Hydraulic structures, Sedimentary uctures, Equipment, Materials, Labor.

st information on erosion and sediment control asures for 25 methods in current widespread were presented in a manner to provide a sound sis for estimating local costs. Using three prinal cost elements: materials, labor, and equipnt, the detailed unit costs presented can also be -dated to reflect inflationary trends in conjuncn with an accepted cost index such as the ENR nstruction Cost Index. The simplified ocedures developed for estimating rainfall ero- index permit the prediction of soil loss (using Universal Soil-Loss Equation) for selected tersheds. The cost data, when applied to soil ses, will reflect comparative costs per ton of l retained. Control effectiveness and economic e of each method can then be used to determine mparable annual cost figures. With this final p, the process of engineering decision-making d selection can be greatly simplified. (See also 77-00775) (Sims-ISWS)
77-00794

IL RIPPING TREATMENTS FOR RUNOFF ND EROSION CONTROL,
rest Service (USDA), Albuquerque, N. M. cky Mountain Forest and Range Experiment ation.
F. Aldon.
In: Proceedings of the Third Federal Inter-Agency dimentation Conference, 1976; Denver, lorado, March 22-25, 1976. Water Resources uncil, Washington, D. C., Sedimentation Committee, p 2-24 - 2-29, 1976. 8 ref.

scriptors: *Erosion control, *Runoff, *Arid ds, *New Mexico, Vegetation, Vegetation effcts, Watersheds(Basins), Soils, Ranges, ainage, Plant growth, Pastures, Forage grasses, nge grasses, Rainfall.
ntifiers: *Soil ripping, *Rio Puerco(NM).

il ripping, a form of deep, wide plowing, effecely reduces runoff and erosion from semi-arid tersheds. This treatment has been used by land nagers on highly erosive soils in the Rio Puerco inage of New Mexico to hold moisture where it ls, therby increasing plant growth and decreas- erosion. This paper reported on a study done and near the San Luis Watersheds on the Rio erco drainage, 93 km (58 miles) northwest of Alquerque, New Mexico, in the transition zone tween woodland and semi-desert grassland. The a is comprised of mesas or uplands, steep rocky aks, and alluvial grasslands. Surface runoff s still reduced 85% and erosion 31% 3 years er the soil ripping treatment. Treatment effeeness declined after 3 to 5 years depending on ounts and intensities of summer thunderstorms. ening old rips that were sealed over with sedint was as effective in controlling runoff as ping between old rips. Reripping by either thod reduced runoff by two-thirds compared h untreated check plots. Ripping caused a favorable shift in forage production from galleta to alkali sacaton. It was learned that ripping effects on runoff are short-lived, but forage production patterns may persist for 10 years; ripping must be done carefully to avoid subterranean channel formation (erosion by soil piping). (See also W77-00775) (Sims-ISWS)
W77-00795

SOIL AND WATER LOSS FROM IMPOUNDMENT TERRACE SYSTEMS,
Agricultural Research Service, Ames, Iowa.
J. M. Laflen, and H. P. Johnson.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 2-30 - 2-41, 1976. 4 fig, 11 ref.

Descriptors: *Terracing, *Erosion control, *Impoundments, *Graphical analysis, Impounded wates, Soil erosion, Sediment control, Agricultural runoff, Agricultural watersheds, Ponding, Tile drains, Conduits, Drains, Erosion, Infiltration.
Identifiers: *Impoundment terraces.

Impoundment terrace systems greatly reduce sediment discharge from agricultural watersheds. Graphs were presented for selecting orifice size and predicting sediment discharge. Construction and operation problems with impoundment terraces were described, as well as methods for solving these problems. (See also W77-00775) (Sims-ISWS)
W77-00796

EXCAVATED SEDIMENT TRAPS PROVE SUPERIOR TO DAMMED ONES,
Forest Service (USDA), Rolla, Mo. National Forests in Missouri.
C. P. Tryon, B. L. Parsons, and M. R. Miller.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 2-42 - 2-51, 1976. 4 fig, 4 ref.

Descriptors: *Sediment control, *Excavation, *Settling basins, *Missouri, Runoff, Dams, Sedimentation, Construction, Construction costs, Drainage, Industries, Earthworks, Drainage engineering, Controlled drainage, Surface runoff, Sedimentology.
Identifiers: *Sediment traps, Detention dams, Excavated sediment traps.

Stilling basins and various other kinds of small impoundments have been used to trap eroded sediment for many years. Numerous publications, people, and agencies seek to increase their use by extolling their merits. Virtually nowhere, however, is the idea of excavated--rather than impounded--sediment traps even mentioned, let alone recommended as a superior method of accomplishing the sediment control task. A decade of experience on large earth moving jobs in the rugged Missouri Ozarks has shown that excavated sediment traps are incomparably superior to small detention dams in terms of cost, industry acceptance, and sediment trap efficiency. This 'how to' article was a working man's guide to excavated sediment trap design and construction. (See also W77-00775) (Sims-ISWS)
W77-00797

EROSION AND SEDIMENT CONTROL ON RESHAPED LAND,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
L. D. Meyer, and M. J. M. Romkens.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 2-65 - 2-76, 1976. 7 fig, 1 tab, 26 ref.

Descriptors: *Erosion control, *Sediment control, *Land forming, Rainfall, Runoff, Topography, Soils, Slopes, Mulching, Erosion, Soil erosion, Sedimentation, Settling basins, Vegetation, Road construction, Urbanization, Construction.
Identifiers: Soil erodibility, Erosive potential, Sediment traps.

Recent research concerning soil erosion and sediment control on land reshaped for nonagricultural purposes was discussed. Included in this discussion were: adaptation of the Universal Soil Loss Equation, variability of rainfall erosiveness, evaluations of soil erodibility and topographic effects, influence of mulch rates and types, and enhancement of rapid revegetation. Implications of this knowledge and areas of research needs were indicated. (See also W77-00775) (Sims-ISWS)
W77-00798

DEFINING THE SEDIMENT TRAPPING CHARACTERISTICS OF A VEGETATIVE BUFFER. SPECIAL CASE: ROAD EROSION,
Forest Service, Denver, Colo. Rocky Mountain Region.
C. A. Ohlander.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 2-77 - 2-82, 1976. 1 tab, 10 ref.

Descriptors: *Sediment control, *Drainage, *Roads, *Vegetation, Erosion, Sediments, Vegetation effects, Sedimentation, Highways, Runoff, Soils, Soil erosion, Water quality, Equations.
Identifiers: *Road drainage, Standard buffer, Sediment traps, Runoff curve number.

This paper discussed the amount of sediment trapped by a vegetative buffer that may exist below a road drainage outlet. The buffer characteristics were defined in relationship to slope percent, soil erodibility, and a soil-cover complex index called the Runoff Curve Number (RCN). A Standard Buffer was defined as a particular length of site capable of trapping 953 kilograms of sediment per year: Standard Buffer, meters = (16.16 + 17.69 Soil K + 1.34 Slope percent) x (31RCN)/(6900 - 69 RCN), where: Standard Buffer is the slope distance needed for filtering out the sediment, soil 'K' is the soil erodibility index from the universal soil loss equation, and RCN is the Runoff Curve Number from the Soil Conservation Service Engineering Handbook. It was found that the ratio of actual buffer distance to the Standard Buffer distance times 953 kilograms equals the yearly sediment trapped. It was concluded that the relationship of Road Erosion minus Sediment Trapped has implications that can be used as a first approximation of some land use effects on water quality. (See also W77-00775) (Sims-ISWS)
W77-00799

GEOTECHNICAL MANAGEMENT OF FOREST LANDS IN GRANITIC TERRANE,
Forest Service (USDA), Medford, Oreg. Rogue River National Forest.
For primary bibliographic entry see Field 4C.
W77-00800

EVALUATION OF AN EXTENSIVE SEDIMENT CONTROL EFFORT IN THE LOS ANGELES RIVER BASIN,
Forest Service (USDA), Turlock, Calif. Stanislaus National Forest.
E. C. Ruby.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 2-91 - 2-102, 1976. 7 fig, 3 ref.

Descriptors: *Sediment control, *Dams, *Sediment yield, *California, Floods, Forests,

Forest fires, Regression analysis, Sedimentation, watersheds(Basins), Sediments, Sedimentary structures, Sediment transport, Runoff, Rivers, Erosion.
Identifiers: *Check dams, *Los Angeles River Basin(Calif).

The Los Angeles River Flood Prevention Project, authorized by Congress in 1941, included sediment control. One component of the plan was to construct 852 small check dams, 24 to 30 feet in height, in key channels, using reinforced concrete cribbing. The study used single regression analysis to relate the sediment yield of treated channels, for several years before treatment, to a norm. The treated channel was then related to the same norm to determine its post treatment performance to the amount of sediment expected without treatment. A second regression used annual runoff, in place of the norm, to analyze the influence of check dams. The conclusions of the study were: (1) There is a temporary reduction in the sediment yield to the basin during the time that the check dam system fills to mature debris cones. (2) Once the system is full, the sediment yield at the basin will return to normal, or perphaps slightly higher than normal. (3) The check dam systems do not influence the rate of sedimentation relative to runoff. (4) A burned watershed, or a major flood, can induce a treated channel to unload the temporary sediment storage in the system. This can be a small volume, or a catastrophic amount, depending on how many years have elapsed in which to store sediments. (5) The check dam systems can be breached by large boulders in major floods. (See also W77-00775) (Sims-ISWS)
W77-00801

SEDIMENT CONTROL AT IMPERIAL DAM,
Bureau of Reclamation, Yuma, Ariz. Yuma Projects Office.
T. H. Moser, and W. D. Sears.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 2-103 - 2-123, 1976. 4 fig, 1 tab, 10 ref.

Descriptors: *Sediment control, *Dams, *Colorado River, Sediments, Settling basins, Dredging, Suspended solids, Sediment load, Sediment transport, Sediment yield, Canals, Silts, *Arizona.
Identifiers: *Imperial Dam(Ariz), *Parker Dam(Ariz).

The construction of major dams and reservoirs on the Colorado River has reduced the chance of major floods and generally stabilized the river. However, along much of the lower Colorado River, channel and bank stabilization work is still required to reduce the sediment transport to a practical minimum within multi-purpose concepts for control and usage of the river facility. In the 238 kilometer (148 mile) meandering river channel from Parker Dam to Imperial Dam, sediment is continuing to be transported downstream in large quantities. The amount transported is largely contingent on the flow in the river and the degree of stabilization. Some reaches of the river have received stabilization treatment while other reaches have not. Since about 1963 water has been released from storage at Parker Dam only in the amount required for downstream irrigation and domestic uses and for scheduled deliveries of Treaty water to Mexico. As a result of these conditions, an annual average of about 726,000 metric tons (800,000 U.S. tons) of sediment have passed Imperial Dam in recent years. In addition, however, there has been a continued buildup of sediment in the reservoir. In the design of Imperial Dam, quite different sediment control facilities were provided for the two canal diversions. The All-American Canal desilting facilities consist of three double basins with 12 large rotating scrapers in each half basin. On the Gila Gravity Main Canal a flushing-type settling basin was used. Sediment from the control facilities is returned to the river below Imperial Dam where it is sluiced downstream to Laguna Settling Basin. At this location sediment is periodically removed by dredge. Dredging is also required periodically to keep a channel open to the Gila Canal headworks. (See also W77-00775) (Sims-ISWS)
W77-00802

DETERMINING EROSION FROM HAWAIIAN AGRICULTURAL LANDS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
G. W. Frasier, J. A. Replogle, K. R. Cooley, and S. A. El-Swaify.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 2-124 - 2-134, 1976. 2 fig, 2 tab, 13 ref.

Descriptors: *Soil erosion, *Sediments, *Hawaii, *Agricultural runoff, Watersheds(Basins), Agricultural watersheds, Agriculture, Farm management, Measurement, Instrumentation, Sampling, Suspended solids, Crops, Flumes, Sugarcane, Rainfall, Runoff, Sedimentation, Sediment control.
Identifiers: Pineapples.

Techniques, instrumentation, and preliminary results of studies to determine the natural rainfall runoff and associated soil erosion from six small watersheds within fields of sugarcane and pineapple in Hawaii were presented. The initial results indicated that with current cultural practices, rainfall runoff and soil erosion are negligible from fields with a crop cover, but may be significant from roads within the cropped area, and during and after harvest. (See also W77-00775) (Sims-ISWS)
W77-00803

THE UNIVERSAL SOIL LOSS EQUATION AS ADAPTED TO THE PACIFIC NORTHWEST,
Washington State Univ., Pullman. Agricultural Research Center.
For primary bibliographic entry see Field 2J.
W77-00804

TECHNIQUES OF RESEARCHING INFORMATION FOR THE DEVELOPMENT OF A MANUAL TO VEGETATE SOILS OF LOW PRODUCTIVITY DISTURBED BY CONSTRUCTION ACTIVITIES,
Midwest Research Inst. Kansas City, Mo.
F. W. Bennett, and R. L. Donahue.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 2-148 - 2-157, 1976. 2 fig, 1 tab, 3 ref.

Descriptors: *Publications, *Soils, *Erosion, *Vegetation, Information exchange, Information retrieval, Libraries, Reviews, Technical writing, Soil types, Construction, Soil-water-plant relationships, Soil classification, Erosion control, Sediment control, Projects.
Identifiers: *Manual development.

This paper explained the strategy, planning procedure, resource personnel used, documentation, and special problems encountered by the Midwest Research Institute in the process of developing a manual under contract with the United States Environmental Protection Agency on vegetating soils of low productivity disturbed by construction activities. The manual emphasized the control of soil erosion and the reduction in emission of sediment. Persons, agencies, and institutions contacted for resouce information totalled 203. More than 1,000 documents were studied, 420 of which were considered sufficiently useful to be included in the list of references. (See also W77-00775) (Sims-ISWS)
W77-00805

THE DILEMMAS OF SETTING SEDIMEN STANDARDS,
Colorado State Univ., Fort Collins. Dept. of Civ Engineering.
For primary bibliographic entry see Field 5G.
W77-00806

DESIGN AND PERFORMANCE OF ROC REVETMENT TOES,
Army Engineer District, Kansas City, M Hydrologic Engineering Branch.
For primary bibliographic entry see Field 8D.
W77-00807

CONTROL OF TURBIDITY AT CONSTRU TION SITES,
Bureau of Reclamation, Denver, Colo. Enginee ing and Research Center.
E. J. Carlson
In: Proceedings of the Third Federal Inter-Agenc Sedimentation Conference, 1976; Denve Colorado, March 22-25, 1976. Water Resource Council, Washington, D.C., Sedimentation Co mittee, p 2-180 - 2-190, 1976. 1 tab, 19 ref.

Descriptors: *Erosion control, *Turbidit *Suspended solids, *Regulation, Soil erosio Construction, Legal aspects, Water pollutio Legislation, Sediment control, Measuremen Monitoring, Information exchange, Constructio costs, Reservoirs, Dams.
Identifiers: *Turbidity control, *Public Law 9 500, Construction sites.

A study team was organized at the Bureau Reclamation Engineering and Research Cente Denver, Colorado, to collect and disseminate i formation on Control of Turbidity at Constructio Sites following the requirements of Public Law 9 500. A summary of most of the areas in which i formation was assembled was included in the r port. A statement of policy on water pollution co trol in the United States by the Board of Control the Water Pollution Control Federation was give Public Law 92-500 and two Executive Orders fro the Office of the President on pollution contr were reviewed. The National Pollution Discharg Elimination System (NPDES) was described. Tu bidity measurement and causes of turbidity at co struction sites were described. An example analysis of turbidity data obtained with typical tu bidity measuring instruments and the accuracy o tained was given. Some typical variations of b prices for control of turbidity at typical Bureau Reclamation projects were listed. The variation turbidity standards in the Western United Stat was discussed. (See also W77-00775) (Sims-ISWS
W77-00808

NUTRIENTS LOST IN DEBRIS AND RUNOF WATER FROM A BURNED CHAPARRA WATERSHED,
Forest Service (USDA), Berkeley, Calif. Pacif Southwest Forest and Range Experiment Station
For primary bibliographic entry see Field 4C.
W77-00810

SEDIMENT PROBLEMS IN THE MOHAV VALLEY - A CASE HISTORY,
Bureau of Reclamation, Boulder City, Nev. R gion 3; and Bureau of Reclamation, Boulder Cit Nev. River Development Branch.
E. L. Johns.
In: Proceedings of the Third Federal Inter-Agenc Sedimentation Conference, 1976; Denve Colorado, March 22-25, 1976. Water Resource Council, Washington, D.C., Sedimentation Co mittee, p 4-64 - 4-75, 1976. 2 fig, 1 tab, 4 ref.

Descriptors: *Sedimentation, *Colorado Rive *Reservoirs, *Environment, Rivers, Managemen

Water management(Applied), Sediment load, Bed load, Aggradation, Fish, Wildlife, Wildlife management, Valleys, Marshes, Lakes, Settling basins, Recreation, Sedimentology, Arizona, California, Nevada.
Identifiers: *Lower Colorado River, *Mohave Valley(Ariz-Calif-Nev).

Sedimentation technology plays an important role in the Bureau of Reclamation's Lower Colorado River Management Program. Public demands also receive major consideration in the decision-making process. The experience of the Bureau of Reclamation in the Mohave Valley after construction of Parker Dam was discussed. Aggradation above Lake Havasu caused a critical situation near Needles, California, where railroad facilities and other developments were inundated or threatened by the rising river. This prompted passage of Federal legislation and authorized the Bureau of Reclamation to take the needed action. In its early stages, the river management program centered on reconstruction of the river channel by dredging and related work. It evolved by stages into a comprehensive program which now includes the improvement of the river and related features for fish and wildlife, general recreation, and other uses. The gathering of sediment and hydraulic data is an essential part of the overall program. Selected information from the data collection program was summarized to illustrate some of the changes brought about. The changing requirements in the Mohave Valley were discussed. Future management will be governed increasingly by publicly expressed environmental concerns. Methods of assuring appropriate input in program planning such as formation of the Lower Colorado River Management Program Coordinating Committee were described. (See also W77-00775) (Sims-ISWS)
W77-00820

SEDIMENT TRANSPORT STUDIES IN THE DELTA-MENDOTA CANAL AND THE CALIFORNIA AQUEDUCT,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
For primary bibliographic entry see Field 2L.
W77-00822

THE ROLE OF SEDIMENT PROBLEMS IN HYDROELECTRIC DEVELOPMENT,
Federal Power Commission, Washington, D.C. Office of Energy Systems.
S. S. Fan.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 4-149 - 4-161, 1976. 10 ref.

Descriptors: *Sedimentation, *Reservoirs, *Rivers, *Dams, Sediments, Effects, Erosion, Suspended solids, Hydroelectric plants, Lake sediments, Water resources, Storage capacity, Silts, Sediment control, Sediment yield, Fish, Sedimentology.

When an artificial interference, such as a dam, is built on a graded river, the streamflow characteristics and the sediment carrying capacity of the river change. These modifications upset the equilibrium already established in that river. In turn, this unbalanced situation sometimes has a significant and unexpected impact on the environments in the vicinity of and, possibly, far away from the dam structure. This paper briefly defined the sedimentation problems involved and discussed the factors of concern in the design and planning of a hydroelectric project. Considerations from the engineering, environmental, and economic point of view were included. Also, deficiencies in the present technology and necessary research were discussed. (See also W77-00775) (Sims-ISWS)
W77-00826

SEDIMENTATION IN COON CREEK VALLEY, WISCONSIN,
California Univ., Los Angeles. Dept. of Geography.
S. W. Trimble.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 5-100 - 5-112, 1976. 7 fig, 4 tab, 4 ref.

Descriptors: *Sedimentation, *Deposition(Sediments), *Erosion, *Wisconsin, Watersheds(Basins), Valleys, Agriculture, Land use, Channel morphology, Bank erosion, Soil erosion, Surveys, Erosion control, Sediment control, Sedimentology.
Identifiers: *Coon Creek(Wis), Driftless area.

Coon Creek Valley is a severely eroded watershed in the driftless area of Wisconsin. Between c. 1850 and 1938, a net total of about 19,500 cu dkm (16,000 acre-ft) of sediment was deposited within the system, a rate of about 56 cu dkm/sq km (116 acre-ft/sq mi), or 0.7 cu dkm/sq km/yr (1.5 acre-ft/sq mi/yr) from the watershed exclusive of the main valley flood plains. These figures do not include colluvium or material transported from the system by streamflow. Recent studies concluded that between 1938 and 1974 sedimentation continued, but the total represents only about half the previous rate. Within the system, however, there continued a partial transfer of material with net export from tributaries and net deposition in the lower-gradient main valley. Within the past few years, there has been little deposition, and the present rate may be less than 10% of the high rates of the 1920's and 30's. This decrease was attributed primarily to changes of land use and land treatment. (See also W77-00775) (Sims-ISWS)
W77-00835

CHANNEL IMPROVEMENTS OF THE MISSOURI RIVER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
E. V. Richardson, and H. Christian.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 5-113 - 5-124, 1976. 9 fig, 1 tab, 12 ref.

Descriptors: *Missouri River, *Channel improvement, *Sediment control, *Erosion control, Dams, Dikes, Structures, Braiding, Sediment discharge, Flow, Streamflow, Suspended solids, Deposition(Sediments), River beds, Particle size, Navigation, Flood control, Discharge(Water), Engineering, Rivers.
Identifiers: Channelization.

The lower Missouri River channelization is a classic example of engineers who worked with nature to change a liability to an asset. The Missouri was changed from an uncontrolled, sediment laden, unsightly, flooding, and eroding river to an orderly, well-behaved, clear and scenic river. The river was changed from an economic drain to an asset. The Missouri River is about 2500 miles long. At Sioux City, Iowa it has an average annual flow of 31,700 cfs (73 years of record). Prior to river development, the average annual sediment discharge was 164 million tons at Omaha, Nebraska (13 years of record). After development, average annual discharge decreased to 28 million tons (19 years of record). (See also W77-00775) (Sims-ISWS)
W77-00836

PATTERNS OF SCOUR AND FILL IN POOL-RAPID RIVERS,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2J.
W77-00837

SEDIMENT RUNOFF DURING HIGHWAY CONSTRUCTION,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4C.
W77-00847

WATER RESOURCES OF THE ROCK RIVER WATERSHED, SOUTHWESTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-00848

WATER RESOURCES OF THE ROOT RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-00849

COMPARISON OF SYSTEMS AND PHYSICAL HYDROLOGY APPROACHES TO HYDROLOGIC MODELLING,
Wollongong Univ. Coll. (Australia).
For primary bibliographic entry see Field 2A.
W77-00939

THE APPLICATION OF THE SACRAMENTO RAINFALL MODEL TO A LARGE ARID CATCHMENT IN WESTERN AUSTRALIA,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 2A.
W77-00951

WIND EROSION OF SAND AND MEASURES FOR RECLAMATION IN THE ZONE OF THE KARA KUM CANAL, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
O. R. Kurbanov, and A. Arnalgel Dyev.
Probl Osvoeniya Pustyn 2, p 76-79, 1975.

Descriptors: *Wind erosion, *Sands, Canals, *Land reclamation, Erosion control.
Identifiers: *Turkmen-SSR, *Kara Kum Canal(USSR).

The Kara Kum Canal (Turkmen SSR, USSR) possesses a peculiar wind regime causing sand deflation in some areas. Annual sand movement has been directed southeastward, almost in a perpendicular manner to the Kara-Kum canal course. Therefore most reclamation work should be done on the right bank of the canal.–Copyright 1976, Biological Abstracts, Inc.
W77-00970

SOILS OF THE MESHED TRACT IN SOUTHWESTERN TURKMEN SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2G.
W77-00975

WATERSHED IMPROVEMENT DISTRICTS.
For primary bibliographic entry see Field 6E.
W77-01000

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

DEVELOPMENT OF A SYSTEM TO DETECT AND MONITOR SEDIMENT POLLUTION,
Rhode Island Univ., Kingston. Dept. of Civil and Ocean Engineering.
For primary bibliographic entry see Field 5B.
W77-00539

SIMPLE METHOD MEASURES SUSPENDED SOLIDS,
American Enka Co., Clemson, S.C.
D. F. Rich, J. R. VanSurdam, and P. Karr.
Water and Sewage Works, Vol. 123, No. 7, p 46-47, July, 1976. 3 ref.

Descriptors: *Analytical techniques, *Suspended solids, *Measurement, *Sampling, Equipment, Costs, Performance, Water quality control, Waste water treatment, *Pollution identification.

A simple method for estimating the amount of suspended solids in a clarifier is described which gives more accurate results than those obtained by the conventional method of multiplying the mixed liquor suspended solids concentration by the clarifier volume. The method involves lowering an open-ended plexiglass tube in the clarifier. When this tube reaches the clarifier bottom, a hinged stopper mounted on the bottom of the tube is pushed into the end of the plexiglass tube, thereby sealing it. The tube is then withdrawn from the clarifier and its contents dumped into a container and thoroughly mixed. Suspended solids determined on a sample taken from this container represent the average solids concentration in a vertical plane through the clarifier. Multiplying this concentration by the volume of the clarifier provides a better estimate of the amount of solids in the clarifier. A commercial sampler for employing the above technique has been built at a total cost of $38.00 which covers the tube assembly parts, mast, and hoist. (Kreager-FIRL)
W77-00596

APPLICATIONS OF AUTOMATIC EQUIPMENT TO WATER ANALYSIS,
D. G. Thomson.
Process Biochemistry, Vol. 11, No. 5, p 44-45, June 1976. 3 tab.

Descriptors: *Pollutant identification, *Analytical techniques, *Automation, *Monitoring, Phenols, Ammonium compounds, Phosphates, Nitrates, Nitrites, Chemical oxygen demand, Nitrogen, Ammonia, Chlorides, Silica, Equipment, *Water analysis.
Identifiers: Cyanide, Thiocyanate.

Advances in the automation of water analysis equipment are reviewed. An automatic analyzer capable of measuring thiocyanate, phenols, cyanide, ammonium ion, phosphate, and nitrate/nitrite is described along with its application to coke oven effluent monitoring. An automatic instrument for measuring chemical oxygen demand involves the use of an aluminum heating block which can be programmed by the operator. A self-contained series of reflux heads fits directly onto the system, thus allowing the simultaneous digestion of up to 20 samples over an exactly timed and temperature controlled interval. The digested sample is then transferred to sample cups where chemical oxygen demand is determined automatically. An automatic analyzer capable of measuring nitrite, total organic nitrogen, phosphate, ammonia, chloride, and silica is also described. The instrument is capable of handling 60 samples/hour and has the capacity for up to 12 channels. (Kreager-FIRL)
W77-00597

MULTIELEMENT AND CHLORINATED HYDROCARBON ANALYSIS OF MUNICIPAL SEWAGE SLUDGES OF AMERICAN CITIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Nuclear Reactor Lab.
A. K. Furr, A. W. Lawrence, S. S. C. Tong, M. C. Grandolfo, and R. A. Hofstader.
Environmental Science and Technology, Vol. 10, No. 7, p 683-687, July 1976. 2 tab, 32 ref.

Descriptors: *Sewage sludge, *Pollutant identification, *Dieldrin, *Polychlorinated biphenyls, *Trace elements, Cities, Surveys, Fluorine, Gold, Mercury, Copper, Lead, Nickel, Zinc, Municipal wastes.
Identifiers: Barium, Antimony, *Chlorinated hydrocarbons.

Data from an analytical survey of 68 elements, dieldrin, and polychlorinated biphenyls conducted on municipal sewage sludges sampled during 1972-1973 from 16 American cities are reported. Fluorine levels were high for several cities which fluoridate their water. The level of polychlorinated biphenyls was highest for Schenectady, New York and was possibly the result of wastes generated by a predominant manufacture of electrical equipment in the city. Levels of gold were especially high in Miami and San Francisco sludges. Mercury was also high in these same two sludges. The high levels of both metals may be due to geochemical sources. A number of elements were notably high in sludges from other specific cities. These included: antimony, copper, and lead (Philadelphia); nickel (Denver, Los Angeles, Miami, Milwaukee, and Philadelphia); barium (Ithaca and Los Angeles); and zinc (Los Angeles and Philadelphia). (Kreager-FIRL)
W77-00598

CADMIUM ACCRUAL IN COMBINED WASTE-WATER TREATMENT-AQUACULTURE SYSTEM,
Environmental Management Inst. Marion, Mass.
For primary bibliographic entry see Field 5D.
W77-00600

INSTRUMENTATION IN THE WATER INDUSTRY.
Water Services, Vol. 80, No. 964, p 370, 372, June, 1976.

Descriptors: *Flow measurement, *Monitoring, *Effluents, *Weirs, Hydraulic structures, Flow, Engineering structures, Analytical techniques, Liquid wastes, Flow rates, *Instrumentation.

A technique for measuring and recording effluent flow is described. The technique employs a vee-notch weir tank in the effluent channel in which the head of liquid over the weir has a known relationship to the rate of flow. A dip-tube fed with compressed air in the tank converts the head of liquid into a pressure which is fed to a suitably calibrated liquid flow recorder. If it is not practicable to fit a weir tank, the recorder can be used in conjunction with a venturi flume. The use of a vee-notch weir plate is preferred because it has the advantage that the shape of the issuing jet is geometrically similar at all heads. This makes it possible to use a standard scale shape for the recorder and gives interchangeability of chart ranges. As in all weir plate measurements, the liquid should be practically motionless apart from the movement of particles towards the notch. In practice this is achieved by fitting the weir plate in the side or end of a tank at a point remote from the notch. (Kreiger-FIRL)
W77-00601

VARIABLE NATURE OF CHEMICAL COMPOSITION OF SEWAGE SLUDGES,
Purdue Univ., Lafayette, Ind. Inst. of Environmental Health; and Purdue Univ., Lafayette, Ind. Agricultural Experimental Station.
L. E. Sommers, D. W. Nelson, and K. J. Yost.
Journal of Environmental Quality, Vol. 5, No. 3, p 303-306, July-September, 1976. 6 tab, 11 ref.

Descriptors: *Pollution identification, *Sewage sludge, *Chemical analysis, *Municipal wastes, *Chemical properties, Indiana, Cities, Carbon, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Iron, Cadmium, Zinc, Copper, Nickel, Lead, Sludge disposal, Organic compounds, Inorganic compounds.

Sewage sludge samples were collected over a year period from eight Indiana cities and we analyzed for carbon, nitrogen, phosphorus, pota sium, calcium, magnesium, ironn, cadmium, zin copper, nickel, and lead. The sludges contain approximately 50% organic matter and 1-4% in ganic carbon. Organic and inorganic carbon, ganic nitrogen, inorganic phosphorus, calciu and magnesium were present in a given sludge a relatively constant concentration with respect sampling time. Inorganic nitrogen, orga phosphorus, potassium, and all metals were fou to be quite variable with time for sewage slud produced by a given city. In general, orga nitrogen and inorganic phosphorus constituted t majority of total nitrogen and phosphorus, resp tively, in sludges. The largest deviations betwe the mean and median were found for cadmiu zinc, copper, nickel, and lead. The variable natu of inorganic nitrogen and metals in sludges dicates that a sound sampling and analysis p gram is essential prior to formulating recomme dations for rates of sewage sludge application soils used for crop production. (Kreager-FIRL)
W77-00602

COMPLEXATION OF TRACE METALS ETHYLENEDIAMINETETRAACETIC AC (EDTA) IN NATURAL WATERS,
Water Pollution Research Lab., Stevena (England).
J. Gardiner.
Water Research, Vol 10, No 6, p 507-514, 1976 fig, 4 tab, 33 ref.

Descriptors: *Chelation, *Organic acids, *Meta *Sewage, Surface waters, Chemical analys Mathematical studies, Domestic wastes, Wa pollution effects, Fish, Algae, Calcium, Ions, To icity, Detergents.
Identifiers: Complexation, Metal organic co plexes, Ethylenediaminetetraacetic acid.

Concentrations of the chelating ag ethylenediaminetetraacetic acid in detergents, p mary and secondary sewage, and river water w determined, and a method for calculating the tent of complexation of trace metals by the chel ing agent in the presence of calcium and oth complexing agents was develop Ethylenediaminetetraacetic acid was present at average concentration of 170 micrograms/liter domestic sewage and at higher concentrations sewage containing industrial effluents. Calcu tions revealed that despite the competitive eff of calcium in hard wat ethylenediaminetetraacetic acid at the concent tions found in sewage and river water is sufficie in most cases to complex most of the import trace metals to a considerable extent. The t dency of ethylenediaminetetraacetic acid to ke metal ions in solution could lead to increased tra metal mobility in water courses and a reduced r of removal of trace metals by adsorption a precipitation in lakes and reservoirs. Chelati agents may also be a factor in stimulating al growth and in reducing the toxicity of trace met to fish. Insufficient information exists to establi the net effect of ethylenediaminetetraacetic a on the aquatic environment, however. (Kreag FIRL)
W77-00604

PRECISION AQUARATOR SPEEDS C DETERMINATION,
T. Viraraghavan.
Water and Sewage Works, Vol. 123, No. 8, p 81, August, 1976. 3 fig, 1 tab, 3 ref.

Descriptors: *Chemical oxygen dema *Analytical techniques, *Pollutant identificati *Spectroscopy, *Oxidation, Instrumentation, C bon dioxide, Chemical reactions.
Identifiers: Nondispersive infrared analysis.

A device which produces rapid and reliable chemical oxygen demand detrminations is described that works on the combustion-infrared principle. A 20-microliter sample (homogenized in a Waring blender) is injected by syringe into the instrument. The sample is swept through a platinum catalytic combustion furnace by a stream of dry carbon dioxide which oxidizes the pollutants to carbon monoxide and water. The water is stripped out in a drying tube, and the reaction products are then passed through a second platinum catalytic treatment. The carbon monoxide concentration is then measured by an integral nondispersive infrared analyzer, and the resultant reading is directly converted to chemical oxygen demand by the use of a calibration curve. The method is best suited for oxygen demands in the range of 50-300 milligrams/liter, although operation down to 10 milligrams/liter is feasible. (Kreager-FIRL)
W77-00605

DEVELOPMENT OF WATER QUALITY SAMPLING PROGRAMS,
Hydrocomp, Inc., Palo Alto, Calif.
R. G. Bourne.
Simulation Network Newsletter, Vol. 8, No. 2, p 5-8, March 1976. 2 fig, 1 tab.

Descriptors: *Analytical techniques, *Water quality, *Water sampling, Programs, *Data collections, Model studies, Analysis, Planning, Sampling.

Procedures are described which should be followed in developing a sampling program that provides data not only characteristic of water quality within the system but also that meet requirements necessary for use by the selected model. A study for the Central Midlands Regional Planning council (CMRPC) is used to illustrate the development of such a sampling program. The scope of the sampling program is defined by the overall goals and objectives of a water quality study. Awareness of model requirements is also essential to the development of a sampling program which provides homogeneous data series acceptable to the model. Data which are not representative of temporal and spatial variations in the system have little value. The first step in designing a water quality sampling program is determining the goals and objectives of the water quality study. The sampling program should then be designed as a function of the goals and objectives. The model which is best suited to providing the necessary analyses required to meet the goals and objectives of the study should then be selected. The sampling program should then be re-examined and altered if necessary to assure that the input requirements of the model will be satisfied by the data. (Snyder-FIRL)
W77-00618

HYDROGEN SULFIDE IN BOTTOM WATER NEAR A SEWAGE SLUDGE DUMPING SITE,
Brookhaven National Lab., Upton, N.Y. Dept. of Applied Science.
F. W. Barvenik, F. B. Hill, V. P. Aneja, and R. M. Felder.
Technical Report BNL 20778, October, 1975. 27 p, 5 fig, 3 tab, 30 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Hydrogen sulfide, Aquatic environment, *Seawater, Sewage sludge, Sludge disposal, Gas chromatography, On-site investigations, New York.
Identifiers: Reduced sulfur compounds, Disposal sites, *New York Bight.

An attempt was made to determine the concentrations of reduced sulfur compounds in bottom water in the vicinity of a sewage sludge dumping site in the apex of the New York Bight and to determine the utility of a field-adapted gas chromatographic system as an analytical tool for such a study. The study site was in the center of a depression which tends to collect sludge sediments; the water depth at the site is about 33 to 34 m. Water from 2 m above the bottom was pumped on board the research ship and then through a gas-liquid contactor. Volatile compounds transferred to the gas phase were passed to the gas chromatograph. The gas chromatographic technique used permits the detection of the entire spectrum of volatile sulfur compounds and, at least for hydrogen sulfide, is considerably more sensitive than the usual wet chemical methods. Although significant peaks were found for hydrogen sulfide, peaks for other sulfur compounds were not clearly evident. Assuming an equilibrium distribution of hydrogen sulfide between gas and liquid phases in the contactor, the concentration of total sulfide dissolved in the bottom water was estimated at 0.03-0.08 microM. The bottom water was partially depleted of dissolved oxygen and contained a small population of sulfate reducers (Desulfovigrio desulfuricans). (Snyder-FIRL)
W77-00620

SELF-MONITORING PROCEDURES: BASIC LABORATORY SKILLS,
Charles County Community Coll., LaPlata, Md.
C. M. Schwing.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 919, $5.50 in paper copy, $3.00 in microfiche. Report EPA-430/1-75-008, June, 1975. 131 p, 3 fig, 13 tab, 19 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Analytical techniques, *Treatment facilities, Mathematics, Effluents, Measurement, Microbiology, Engineering education, Volumetric analysis, Laboratory equipment, Education, Chemicals, Sanitary engineers, Bacteria, *Monitoring.

This Basic Laboratory Skills course is designed for treatment plant operators or technicians who must monitor effluent discharges under a National Pollutant Discharge Elimination System (NPDES) permit and who have little prior laboratory experience. The instructor's manual contains all the instructional package worksheets for presenting the course. The mathematical material includes whole numbers, decimals, the metric system, percentage, and formulas. The chemical laboratory material contains such applications as weighing, techniques, laboratory equipment use, and preparing and standardizing reagents. Basic microbiological techniques are also introduced. (Snyder-FIRL)
W77-00624

INSPECTION MANUAL FOR THE ENFORCEMENT OF NEW SOURCE PERFORMANCE STANDARDS: SEWAGE SLUDGE INCINERATORS,
PEDCo-Environmental, Inc., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-00627

MAINTENANCE MANUAL: INSTRUCTIONS FOR SENSOR CLEANING AND FIELD CALIBRATION. THE POTOMAC RIVER WATER POLLUTION MONITORING SYSTEM,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Div. of Pollution Surveillance.
A. F. Mentink.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 783, Price codes: A03 in paper copy, A01 in microfiche. September, 1966. 31 p, 3 append.

Descriptors: *Pollutant identification, *Analytical techniques, *On-site data collections, *Automation, *Automatic control, Water quality, *Maintenance, *Instrumentation.

A very important, but underemphasized, aspect of automatic acquisition systems for water quality data is maintenance of field instrumentation. The sensitivity of the electrodes decreases as contaminants accumulate on them. The more rigorous and disciplined the program of maintenance, the higher the probability of getting useful and valid data. Instructions for first-level maintenance (sensor cleaning and field calibration) are covered. The parametric systems discussed include pH, conductivity, dissolved chlorides, dissolved oxygen, oxidation-reduction potential, solar radiation intensity, and temperature. (Snyder-FIRL)
W77-00629

A SIMPLE TUBE-TYPE WATER PROFILE SAMPLER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. G. Gilbert, and J. B. Miller.
Water Resources Research, Vol. 12, No. 4, p 812-815, August 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Instrumentation, *Sampling, *Plastics, Farm ponds, Irrigation canals, Lakes, Ponds, Dissolved oxygen analyzers, Chemical analysis, Tubes, Water sampling, Agriculture, Pollutant identification.
Identifiers: *Water profile sampler, *Plexiglass sampler, Recreational lakes, Dissolved oxygen profiles, Biological analysis, Tube-type sampler, Surface water sampling.

A plexiglass tube-type water profile sampler was designed for use in relatively shallow bodies of water, such as farm ponds, small recreational lakes, irrigation canals, and the surface 2 m of larger lakes and rivers. The sampler was a plexiglass tube with holes drilled at intervals (side ports) corresponding to water layers which were to be sampled. To obtain a water sample, the tube (open at both ends and with the side ports closed) was gently lowered vertically into the water. With the top stoppered, the tube was raised and its bottom stoppered just under the water surface. While the tube was held vertically, the water profile samples were rapidly and easily obtained after removing the top stopper and successively collecting from top to bottom the water sample from each side port. Dissolved oxygen (DO) profiles of the ponds measured with an oxygen probe directly in the ponds were similar to DO profiles of water samples collected with the tube sampler. Chemical and biological analyses of water samples obtained with the tube-type sampler and two other standard type water samplers (Kemmerer and Van Dorn) were compared. The analyses revealed that similar relative results were obtained from water samples collected with all three samplers, but the tube-type sampler was more desirable for obtaining water profile samples because of its simplicity of design and operation especially in small ponds. (Roberts-ISWS)
W77-00641

MANGANESE IN NARRAGANSETT BAY,
Rhode Island Univ. Kingston. Graduate School of Oceanography.
W. F. Graham, M. L. Bender, and G. P. Klinkhammer.
Limnology and Oceanography, Vol. 21, No. 5, p 665-673, September 1976. 5 fig, 5 tab, 22 ref. EPA R803243-01-0.

Descriptors: *Manganese, *Bays, *Sampling, Saline water-freshwater interfaces, Aluminum, Hydrogen ion concentration, Estuaries, Rivers, Sediments, Chemicals, Chemical precipitation, Adsorption, Metals, Suspended solids, Dissolved solids, Chemical analysis, Analytical techniques, Benthos, Pollutants, *Pollutant identification.
Identifiers: *Narragansett Bay(RI), Desorption.

Concentrations of dissolved manganese and particulate manganese and aluminum were determined in samples from Narragansett Bay, Rhode Island, and its surrounding rivers. Total manganese was approximately conservative, but dissolved and particulate manganese were not.

Desorption may occur in the tidal rivers at low salinities. Most riverine manganese was dissolved, but manganese in the bay was predominantly particulate, probably due to rapid manganese oxidation at bay water pH. The flux of dissolved manganese into bottom waters was about 2 + or - 1 micrograms/sq cm per day. Concentrations in bottom waters were high relative to surface waters. (Sims-ISWS)
W77-00642

ALIPHATIC HYDROCARBONS IN SEDIMENTS OF LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Chemistry.
S. G. Wakeham, and R. Carpenter.
Limnology and Oceanography, Vol. 21, No. 5, p 711-723, September 1976. 4 fig, 2 tab, 56 ref. ERDA E45-12225TA40.

Descriptors: *Sediments, *Organic compounds, *Oil, Pollutant identification, Chemical analysis, Gas chromatography, Sampling, Surveys, Analytical techniques, Lakes, Aging(Physical), Chemicals, Pollutants, *Lake sediments.
Identifiers: *Lake Washington(Wash), *Aliphatic hydrocarbons, Paraffins, Petroleum hydrocarbons, Radiocarbon dating.

The distribution of aliphatic hydrocarbons in sediments from several locations in Lake Washington was determined by gas chromatographic, radiocarbon, and stable carbon isotope analyses. Most surface sediments contained an average of about 1400 microgram/gram dry wt total aliphatic hydrocarbons, of which about 10 microgram/gram were n-paraffins. Gas chromatograms of these hydrocarbons and radiocarbon ages of about 18,000 years B.P. for the aliphatic hydrocarbon fraction suggested the presence of a large component of petroleum hydrocarbons. By contrast, sediments at depth in the sediment column and deposited before about 1880 contained only about 30 microgram/gram total aliphatics and about 5 microgram/gram n-paraffins. These hydrocarbon levels were believed to represent the aged natural background concentrations in Lake Washington. A number of cores analyzed in detail showed an increase in hydrocarbon levels after 1880, which corresponded to the start of a period of growth for the adjacent metropolitan area. (Sims-ISWS)
W77-00643

HYDROCHEMISTRY OF THE PARANA RIVER,
Instituto Nacional de Limnologia, Santo Tomo (Argentina).
For primary bibliographic entry see Field 2K.
W77-00644

AN INEXPENSIVE THERMISTOR FLOWMETER FOR AQUATIC BIOLOGY,
Duke Univ., Durham, N. C. Dept. of Zoology.
For primary bibliographic entry see Field 7B.
W77-00645

HEAVY METALS IN SOME NEW ZEALAND COMMERCIAL SEA FISHES,
Massey Univ., Palmerston North (New Zealand). Dept. of Chemistry, Biochemistry and Biophysics.
For primary bibliographic entry see Field 5C.
W77-00660

A DOUBLE BLIND TEST FOR DETERMINATION OF INTOLERANCE TO FLUORIDATED WATER: PRELIMINARY REPORT,
G. W. Grimbergen.
Fluoride. 7(3), p 146-152, 1974.

Descriptors: *Pollutant identification, *Fluoridation, *Flourides, Water pollution effects, Human diseases, Tests.

A double blind test for the detection of untoward effects from fluoridated water is described. Preliminary results with 60 patients out of a group of 300 indicate that certain individuals are intolerant to fluoride and reproducibly develop gastrointestinal symptoms, stomatitis, joint pains, polydipsia, headaches, and visual disturbances.—Copyright 1975, Biological Abstracts, Inc.
W77-00662

RESEARCH FOR THE DEVELOPMENT OF GUIDELINES FOR CONDUCTING AND ANALYZING AN ENVIRONMENTAL WATER QUALITY STUDY TO DETERMINE STATISTICALLY MEANINGFUL RESULTS,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 7B.
W77-00677

MEASUREMENT OF URBAN RUNOFF PETROLEUM,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W77-00678

EFFECT OF PRESCRIBED BURNING ON SEDIMENT, WATER YIELD, AND WATER QUALITY FROM DOZED JUNIPER LANDS IN CENTRAL TEXAS,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
For primary bibliographic entry see Field 4C.
W77-00679

A SENSITIVE ALGAL ASSAY: AN IMPROVED METHOD FOR ANALYSIS OF FRESHWATERS,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. L. Klotz, J. R. Cain, and F. R. Trainor.
Journal of Phycology, Vol. 11, No. 4, p. 411-414, 1976. 1 fig, 6 tab, 10 ref.

Descriptors: *Cultures, *Oligothrophy, *Bioassay, Rivers, Nutrients, Methodology, Algae, Analytical techniques, Trophic level, *Pollutant identification, *Connecticut, Water analysis.
Identifiers: *Luxury uptake, Willimantic River(Conn), Shetucket River(Conn).

An algal assay capable of detecting the carrying capacity of nutrient-poor rivers was developed. Two problems were eliminated. The first involved culture and preparation of test algal strains. When cells were inoculated into river water samples, growth was supported by nutrients in the sample and these carried-over intracellularly by the inoculum, inaccurately measuring growth. This was especially pronounced in nutrient-poor waters. The second problem concerned inoculum size. Nutrient-rich waters can support larger algal populations than normally found. With nutrient-poor waters and small inocula, time may be spent waiting for sufficient growth to occur to allow quantitation. If the inoculum is heavy, quantitation occurs after short-growth periods, but may overload carrying capacities of nutrient-poor samples, inaccurately indicating their ability to support indigenous flora growth. To eliminate nutrient carryover, growth medium was developed containing less than 4 mg/l total inorganic salts. The test organism, Selenastrum capricornutum (10,000 cells/l) was grown in sterile-filtered river water and transferred daily. Low initial cell numbers permitted more nutrients/cell. Daily transfer exposed samples to greater nutrient differences and provided greater sensitivity. After incubating a week, cells were counted and doublings/day determined. The method is a simple, precise, inexpensive, short-term test useful in studying freshwaters. (Buchanan-Davidson—Wisconsin)
W77-00719

CHEMICAL CHARACTERISTICS AND ACUT TOXICITY OF FOAM ON TWO AERATI LAGOONS,
International Pacific Salmon Fisheries Comm sion, Cultus Lake (British Columbia). Sweltz Creek Salmon Research Lab.
For primary bibliographic entry see Field 5C.
W77-00752

PROCEEDINGS OF THE THIRD FEDERA INTER-AGENCY SEDIMENTATION CO FERENCE 1976.
Water Resources Council, Washington, D.C. Se mentation Committee.
For primary bibliographic entry see Field 2J.
W77-00775

THE USE OF COLOR INFRARED PHOTO RAPHY FOR THE DETERMINATION SUSPENDED SEDIMENT CONCENTRATIO AND SOURCE AREAS,
Forest Service (USDA), Fort Collins, Co Arapaho-Roosevelt National Forest.
For primary bibliographic entry see Field 2J.
W77-00844

WATER RESOURCES OF THE ROCK RIVE WATERSHED, SOUTHWESTERN MI NESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-00848

GEOHYDROLOGY AND WATER SUPPL SHEYMA ISLAND, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W77-00851

ANALYSIS OF HISTORICAL WATER-QUAL TY DATA AND DESCRIPTION OF PLAN FOR SAMPLING NETWORK IN CENTRAL AN SOUTHERN FLORIDA,
Geological Survey, Tallahassee, Fla.
D. A. Goolsby, H. C. Mattraw, A. G. Lamonds, V. Maddy, and J. R. Rollo.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-256 57 Price codes: A07 in paper copy, A01 in microfich Water-Resources Investigations 76-52, Mar 1976. 124 p, 33 fig, 15 tab, 19 ref.

Descriptors: *Water quality, *Data collection *Network design, *Florida, *Surface wate Water analysis, Regression analysis, Evaluatio Chemical properties, Biological properti Nutrients, Trace elements, Pesticides, Plannin Pollutant identification.
Identifiers: *Central and Southern Florida, K simmee River, Lake Okeechobee, Everglades.

Historical water quality data from about 100 sa pling stations on streams, canals and lakes in ce tral and southern Florida were analyzed for ar and temporal variations in water quality, statistic measures of the data, relationships between wat quality variables, and long term changes or tren in water quality. Included in the analysis were da on the major inorganic chemical constituents, te perature, nitrogen and phosphorus species, tra metals, pesticides, organic carbon and biochem cal oxygen demand. Based on the results of t analysis, a network was designed which wou provide data to meet six specific objectives: (water quality accounting, (2) areal assessments detection of gross long-term trends, (4) detecti of toxic and deleterious substances, (5) establish limnological data base on lakes and (6) furnish da on chemical inputs from the atmospher (Woodard-USGS)
W77-00858

ATER RESOURCES OF THE WARM RINGS INDIAN RESERVATION, OREGON,
ological Survey Portland, Oreg.
r primary bibliographic entry see Field 4A.
77-00864

EOLOGY AND GROUND-WATER ESOURCES OF CAMDEN COUNTY, NEW RSEY,
ological Survey, Trenton, N. J.
r primary bibliographic entry see Field 2F.
77-00866

URCES OF ARSENIC IN STREAMS TRIBU-ARY TO LAKE CROWLEY, CALIFORNIA,
ological Survey, Menlo Park, Calif.
r primary bibliographic entry see Field 5B.
77-00867

CCUMULATION AND DISTRIBUTION OF LENIUM IN MUSSEL AND SHRIMP TIS-ES,
ternational Lab. of Marine Radioactivity Monte rlo (Monaco). Oceanographic Museum.
r primary bibliographic entry see Field 5C.
77-00873

EASONAL AND LABORATORY VARIATIONS THE HEALTH OF GRASS SHRIMP LAEMONETES PUGIO: DODECYL SODIUM LFATE BIOASSAY,
my Engineer Waterways Experiment Station, icksburg, Miss. Environmental Effects Lab.
r primary bibliographic entry see Field 5C.
77-00884

HE RELATIONSHIP OF MALATHION AND S METABOLITES TO FISH POISONING,
nvironmental Protection Agency, Gulf Breeze, a. Gulf Breeze Environmental Research Lab.
r primary bibliographic entry see Field 5C.
77-00885

NVESTIGATIONS INTO THE VERTICAL DIS-RIBUTION OF ORGANISMS AND CHEMICAL UBSTANCES IN THE GROUNDWATER IN ALLEYS AND TERRACES: METHODS AND IRST RESULTS, (IN GERMAN),
ax-Planck-Institut fuer Limnologische Schlitz Vest Germany). Limnologische Flusstation.
Husmann.
t J Speleol 6(4), p 271-302, 1975.

escriptors: Distribution, *Spatial distribution, Groundwater, Infiltration, *Chemical wastes, Water pollution sources, *Pollutant identification.
dentifiers: *Organisms, *River Dulda valley(W ermany), *River Wester(W Germany).

the alluvial ground of the River Dulda valley nd in the dilluvial terrace of the River Wester Vest Germany) tubes of various lengths were nk into sand and gravel to sample groundwater different depths. These groundwater pump sta-ons were installated with the aid of an apparatus r drilling bore-holes and by ramming in the pump bes with a pneumatic hammer. The 1st biological nd chemical investigations in these subterranean ater research stations indicated that the vertical stribution of groundwater organisms and chemi-l substances in special cases may depend on the ature of subterranean water currents and the in-ltration of polluted water into the sandy and avelly soils of valleys and terraces.--Copyright 976, Biological Abstracts, Inc.
77-00919

RAMS SURFACE AND DRINKING WATER OMPONENTS, JANUARY--MARCH 1974.
ffice of Radiation Programs, Las Vegas, Nev.
Radiation Data and Reports, Vol 15, No 8, p 502-05 Aug 1974. 4 p, 2 fig, 3 tab, 1 ref.

Descriptors: *Water sampling, *Surface waters, *Potable water, *Radioactivity, *Administrative agencies, Gamma rays, Nuclear wastes, Public health, Radiation, Water pollution effects, Human population, Environmental effects, Analysis, Radioactivity effects, Tritium.
Identifiers: *Radiation data, Environmental radiation ambient monitoring system.

The Environmental Radiation Ambient Monitoring System (ERAMS) began in 1973. It was developed from previously operating monitoring networks to form a single system more responsive to current and projected sources of environmental radiation. The ERAMS Surface and Drinking Water Components consists of 76 drinking water samples taken quarterly from major population centers and selected nuclear facility environs. The radiation data thus assembled include analyses of: (1) tritium on a quarterly basis; (2) gamma scan, gross alpha and beta radioactive measurements annually; and (3) an annual composite for plutonium 238 and 239. The Surface Water Component consists of 55 quarterly surface water samples taken downstream from nuclear facilities or at background stations. A table presents the tritium concentrations in drinking water at selected stations for January-March 1974. Also examined here are the methods by which radiation doses may be determined and the various formulas utilized. (Lauer-Florida)
W77-00954

RADIOACTIVITY IN KANSAS SURFACE WATERS, JANUARY--DECEMBER 1972.
Kansas State Board of Health, Topeka. Radiation Control Section.
Radiation Data and Reports, Vol 15, No 8, p 500-01 Aug 1974. 2 p, 1 fig 1 tab.

Descriptors: *Data collections, *Kansas, *Surface waters, *Radioactivity, *Administrative agencies, Public health, Recreation, Missouri River, Nuclear wastes, Radiation, Nuclear reactors, Gamma rays, Sewage disposal, Water pollution effects, Water sampling, Industrial wastes.
Identifiers: *Radionuclides, Radiation data.

Monitoring the levels of radioactivity in Kansas surface waters is important since both present and future potential use for domestic, recreational, and industrial purposes may be effected. The Radiation Control Section of the Kansas State Department of Health collects liter samples every month at designated locations. The samples are then analyzed for gross alpha and beta radioactivity and scanned for specific radionuclides. The report discusses the analytical procedures used and illustrates the gross alpha and beta radioactivity in Kansas surface waters through one figure and two graphs. The report further states that radioactivity in the surface waters may consist of natural radioactivity picked up by flowing streams, radioactivity from sewage discharge, contributions from industrial sources, and fallout. (Lauer-Florida)
W77-00955

NONPOINT POLLUTION AND WATER QUALITY MONITORING,
Georgia Univ., Athens. Inst. of Community and Area Development, and Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 5G.
W77-00960

OF PCB PPMS FROM GE AND A SNAFU FROM EPA AND DEC,
R. Boyle.
Audobon, Vol 77, p 127-33, November 1975. 7 p.
Descriptors: *Polychlorinated biphenyls, *Aroclors, *DDT, *Chlorinated hydrocarbon pesticides, *Pollutants, Water pollution, Water pollution sources, Industrial wastes, Industrial production, Chemical wastes, Chemicals, Chemical industry, Wastes, Water quality, Fish, Water pollution effects, Water quality standards.

PCB's, or polycholorinated biphenyls, have been shown to produce adverse effects when taken into the human body through the food chain. Studies in Japan have produced evidence of severe acne, cheeselike discharges from the eyes, skin darkening, hearing loss, and other nuerological disorders. In addition, a number of newborn infants had abnormal skin pigmentation, still births were above the national average, and the majority of fetuses studied were smaller than the national standard. As a result of this study, Japan has banned the chemical. PCB's continue to be used in the United States, however, in adhesives for envelopes and tapes, waterproofing of canvas, plastic bottles, caulking compounds, and numerous other products and processes. At the present time abnormally high amounts of PCB's are being dumped into the Hudson River by General Electric. Efforts to reduce or halt their use have not been overly successful. Hudson River bass and Lake Ontario salmon have since been declared nonedible by the New York Department of Environmental Conservation. Such adverse effects have not been unusual. For example, the shrimp and oyster business was seriously damaged in Northwest Florida waters by high levels of PCB's released by a large textile industry. To prevent such adverse effects in the future, conservation groups are attempting to stop the introduction of PCB's into public waterways. (Frank-Florida)
W77-00978

SHIGELLA RESEARCH IN THE SEA AND IN AN ESTUARY: I. FREQUENCY OF BACTERIOPHAGES IN POLLUTED WATER, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 5B.
W77-01020

SHIGELLA RESEARCH IN THE SEA AND IN AN ESTUARY: II. ATTEMPT TO INHIBIT THE ADSORPTION OF SHIGAPHAGES AND STUDIES OF SHIGELLA ON A SELECTIVE MEDIUM, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 5B.
W77-01021

SHIGELLA RESEARCH IN THE SEA AND IN AN ESTUARY: III. IN VITRO DETERMINATION OF THE SURVIVAL TIME OF SHIGELLA SONNEI YCD IN SEA WATER, (IN FRENCH),
Inst. R. Sci. Nat. Belg., Bruxelles, Belg. Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 5B.
W77-01022

SANITARY AND HYGIENIC EVALUATION OF THE QUALITY OF UNDERGROUND DRINKING WATER, (IN RUSSIAN),
Municipal Sanitary Epidemiology Station, Zhukovskii (USSR)
For primary bibliographic entry see Field 5B.
W77-01023

A POLAROGRAPHIC METHOD FOR THE DETERMINATION OF METALS IN WASTE WATERS, (IN ITALIAN),
Florence Univ. (Italy). Inst. of Chemical Analysis.
G. Piccardi, P. Cellini, and Legittimo.
Ann Chim 64(1/2); p 1-6, 1974.

Descriptors: *Pollutant identification, *Polographic analysis, *Metals, Analytical techniques, Sewage, Water pollution.

A polarographic method for the qualitative and quantitative determination of some metals in foul waters and sewage waters is proposed and discussed. The organic substances, after the evaporation of the sample, are destroyed by a slow digestion with nitric and perchloric acid; to the residue a volume of water containing the supporting electrolyte, 10 times smaller than that of original sample, is added. By this way concentrations below 0.1 mg/l in the original sample may be determined.--Copyright 1976, Biological Abstracts, Inc.
W77-01026

HYGIENIC INVESTIGATIONS OF A CASE OF RIVER POLLUTION BY CHEMICAL PLANT WASTEWATERS, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W77-01027

LIPID TRANSFORMATION IN SEAWATER BY OIL-OXIDIZING MICROORGANISMS, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR). Dept. of Marine Sanitation Hydrobiology.
O. G. Mironov, and T. L. Shchekaturina.
Biol Morya (Vladivost) 2, p 58-63m 1975.

Descriptors: *Lipids, Microorganisms, Bacteria, Sea water, *Chromatography, Plankton, Detritus, *Pollutant identification.
Identifiers: Acartia-clausi, Centropages-pontica, Oithona-minuta, Polychaete, *Oil-oxidizing microorganisms, Barnacles.

Thin-layer chromatography was used to study the transformation of lipids of planktonic detrituis in seawater. Natural microflora and pure cultures of oil-oxidizing microorganisms isolated from seawater effect lipid fractions differently. (Bacteria, polychaetes, barnacles, bivale larvae and Acartia clausi, Centropages pontica and Oithona minuta are discussed.)--Copyright 1976, Biological Abstracts, Inc.
W77-01030

ENZYMATIC IN SITU MEASUREMENTS: NEW SEAWATER AND SEDIMENT MEASUREMENT METHODS, (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskude.
T. Gradl.
Kiel Meeresforsch 30(1), p 1-11, 1974.

Descriptors: *Enzymes, Metabolism, Sediments, Measurement, Bacteria, *Electrodes, Phosphorus, Ureas, Ammonia, Color, Sea water, Pollutant identification.
Identifiers: Dehydrogenase, Electode, Enzymatic measurement.

A percolator was constructed to continuously measure metabolic processes in sediments. A continuous flow of water penetrates the sediment. O2 can be excluded. Continuous polarographic control or control with enzyme electrodes is possible. Gases evolved by metabolism can be trapped. An attempt to discriminate bacterial and purely enzymatic processes (free enzymes) by addition of chloroform or toluence (both lethal for bacteria) was unsuccessful. Enzyme electrodes were constructed as a probe for sediments, for the percolator and for the free water. The enzyme electrodes permit the determination of the ratios of Pi/organic P, urea/ammonia, and glycosidically bound glucose/free glucose. The enzyme is coupled to a diazotized anilin resin fixed on a metal electrode as a thin layer. The potentials (measured against Ag-AgCl) correlate with the ratio of the concentrations of substrate and product. Absolute measurements can be performed. The electrodes are calibrated in Tris-HCl-buffer solutions of pH S. To study the fine strucure of sediments, matrix bound color reactions are used. The matrices are fixed to glass slides. Glucose is bound glycosidically to an epoxy resin. After exposition the remaining glucose is measured by a color reaction. Dehydrogenases are detected by 2, 3, 5-triphenyltetrazolim-chloride fixed to a matrix by sprying with a teflon aerosol. The yellow formazan color is measure. H2S is detected by lead acetate which is enclosed in the cells of a dried emulsion. The walls are permeable for gas (H2S), but not for the insoluble reaction product. All reactions are calibrated in Tris-HCl-buffer solutions of pH 8.--Copyright 1976, Biological Abstracts, Inc.
W77-01031

MIXED FUNCTION MONOOXYGENASE OF FISH AS AN INDICATOR OF POLLUTION OF AQUATIC ENVIRONMENT BY INDUSTRIAL EFFLUENT,
Oulu Univ. (Finland). Dept. of Pharmacology.
For primary bibliographic entry see Field 5C.
W77-01065

5B. Sources Of Pollution

HYGIENIC PROBLEMS OF THE FORMATION AND PREDICTION OF CHANGES OF GROUNDWATER QUALITY IN THE CASE OF RECHARGING FROM SURFACE WATER SOURCES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
Y. V. Novikov, and G. V. Gus'Kov.
Gig Sanit 4, p 74-78, 1975.

Descriptors: *Water quality standards, Water pollution, *Groundwater, *Artificial recharge, Public health, *Self-purification.

The degree of self-purification and prediction of groundwater quality in the case of artificial recharge are determined by many factors, including the composition and properties of water arriving at the infiltration plants. The use of polluted surface waters for recharging can decrease the effectiveness of the method and lead to groundwaters not meeting the hygienic standards.--Copyright 1976, Biological Abstracts, Inc.
W77-00528

AN INVESTIGATION INTO THE EFFECT AND CAUSE OF EUTROPHICATION IN GEORGETOWN LAKE, MONTANA,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W77-00536

DEVELOPMENT OF A SYSTEM TO DETECT AND MONITOR SEDIMENT POLLUTION,
Rhode Island Univ., Kingston. Dept. of Civil and Ocean Engineering.
V. A. Nacci.
Available from the National Technical Information Service, Springfield VA 22161, as PB-259 265, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, (1976). 19 p, 5 fig, 3 tab, 11 ref. OWRT A-055-RI(1). 14-34-0001-5040.

Descriptors: Soils, *Resistivity, Metals, Sediments, Trace elements, *Monitoring, Pollutant identification, *Sediment distribution, Cores, Sampling, Path of pollutants, *Rhode Island.
Identifiers: *Sediment pollution(Offshore), *Narragansett Bay(RI).

A system to monitor sediment pollution is presented. A modified electrical resistivity device was used to study laboratory and offshore sediment pollution. In the laboratory, several different soil type saturated in a simulated sea water with without different pollutants, including soap, fert izer, pesticide, paint, and fuel oil were used for i vestigation. The laboratory study results indicat that the presence of the pollutants resulted in considerable change in the electrical resistivity the sediment. A field electrical resistivity stu gave sediment pollution distribution in good agre ment with that obtained from laboratory analy of core samples. Results indicated that the elect cal resistivity device can provide a quick a economical way of monitoring pollution in mari sediments.
W77-00539

INFILTRATION LAGOONS FOR TERTIAR TREATMENT OF STABILIZATION POND E FLUENT,
South Dakota State University, Brookings. De of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-00540

DENITRIFICATION WITH A BACTERIAL DI UNIT,
National Inst. for Water Research, Pretoria (Sou Africa).
For primary bibliographic entry see Field 5D.
W77-00550

ON RADIOACTIVE WASTE MANAGEMEN AN ANALYSIS OF THE PARAMETERS CO TROLLING SUBSURFACE CONTAMINAN TRANSFER,
Alberta Univ., Edmonton. Dept. of Geology.
F. W. Schwartz.
Journal of Hydrology, Vol. 27, p 51-71, 1975. 9 f 12 equ, 15 ref.

Descriptors: *Radioactivity, *Radioactivity fects, *Model studies, Soil water movem *Path of pollutants, Soils, Water polluti sources.
Identifiers: *Radioactivity transfer.

The problem of subsurface, radioactive-contan nant transfer is investigated theoretically throu the development of a two-dimensional mo which considers the simultaneous flow of wa and mass. In addition to the well-known physi transport processes, convection and dispersi the model treats radioactive decay and cati exchange which are two of the most import concentration attenuation processes. The fluence of factors, which control the transp processes, on subsurface contaminant distri tions is demonstrated through the simulation a analysis of a series of hypothetical cases. W respect to the physical transport process hydraulic conductivity, porous medium dispersi ty and the location of the contaminant inflow zo are considered as controlling paramet (Skogerboe-Colo St)
W77-00551

PHYSICAL FUNDAMENTALS OF THE MIXI OF SOLUTIONS OF POLLUTANTS A SEWAGE IN POROUS MEDIA,
Gesellschaft fuer Strahlen- und Umweltforschu m.b.h., Neuherberg bei Munich (West German Institut fuer Radiohydrometrie.
D. Klotz.
Water Research Vol. 9, No. 12, p 783-7 December 1975. 15 fig, 1 tab, 18 ref.

Descriptors: *Water quality, *Groundwater, P lution, *Porous media, Sewage, Diffusi Aquifer characteristics, *Mixing, *Path of pol tants.

The increasing danger of ground-water polluti by pollutants from the environment and by creasing amounts of sewage requires an exami tion of the mechanisms of distribution and tra

ort within the water-bearing stratum. Two mixing rocesses occur in the simultaneous propagation f two miscible liquids in a porous medium (water-earing stratum): hydrodynamic dispersion and olecular diffusion. If a region of flow is marked n a liquid (ground-water) flowing through a orous medium with a further liquid (solution of ollutants, sewage) being miscible therewith, this arked region increases as regards its extension uring the joint movement of the two liquids. A ixing of the 'marking substance' with the flowing iquid occurs, the decrease in concentration of the marking substance' being a measure for the egree of intermixture. (Skogerboe-Colo St)
W77-00554

URBAN SEDIMENT PROBLEMS: A STATEMENT ON SCOPE, RESEARCH, LEGISLATION, AND EDUCATION.
American Society of Civil Engineers, New York. Task Committee on Urban Sedimentation Problems.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol. 101, No. HY4, p 329-340, April 1975. 1 tab, 7 ref.

Descriptors: *Sediments, *Sedimentation, Sediment control, Urban runoff, Urbanization.
Identifiers: *Urban sediments.

Present (1974) erosion control guidelines and echnology indicate that: There are sufficient and varied erosion control guidelines available for use as models for local governments. Past implementation experience can provide valuable information o new programs and help avoid many initial roblems. Evaluation of social and physical damages still remains a weak point in economic analyses of control systems. Existing technology s adequate to design urban erosion control systems; however, design criteria developed for agricultural areas should be reviewed for adequacy in each case until sufficient experience in urban areas is documented and evaluated. Guideline handbooks are meant to provide general locaal information and should not be used arbitrarily as final design manuals. Erosion control systems do not have to be 100% effective in reducing soil loss o be acceptable. Needed research for more useful erosion and sediment control should be focused in two general areas: on improving the application of rurally developed technology to the urban situation and on developing methods and criteria for evaluating social and physical costs of various control systems relative to alternative costs of allowing specific amounts of sediment into specific water bodies. (Skogerboe-Colo St)
W77-00556

MIGRATION OF SALT FROM FEEDLOT WASTE AS AFFECTED BY MOISTURE REGIME AND AGGREGATE SIZE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. Amoozegar-Fard, W. H. Fuller, and A. W. Warrick.
Journal of Environmental Quality, Vol. 4 No. 4 p 468-472 October-December 1975. 2 fig, 6 tab, 14 ref.

Descriptors: *Salinity, *Return flow, *Feed lots, Water management, Water quality control, Soil moisture, *Farm wastes, Waste disposal, *Electrical conductance, Conductivity.
Identifiers: *Manure disposal.

The migration of salt from three different aggregate sizes of feedlot manure under three moisture regimes was evaluated. The three sizes were small (to pass a 40-mesh sieve), medium (0.9 cm in diameter, 2.25 cm in length), and large (4.8 cm in diameter, 2.6 cm in length). The three moisture regimes were: (1) 12 hours saturation, 12 hours drainage by gravity, this step was repeated five times; (2) 12 hours saturation, 12 hours drainage by gravity, 48 hours oven drying at 60C, also repeated five times; and (3) continuous leaching for 60 hours at a constant rate. After each 12 hour saturation period the leachates were collected and the electrical conductivity (EC), pH, and concentrations of K, Na, Ca, Mg, NH4, NO3, C1, S, P, and eight trace elements determined. The EC of the leachate for the first saturation period was highest for the small-sized aggregates under all three moisture regimes (21. 3, 21.2, and 19.3 mmhos/cm, respectively) and the lowest for the large-sized aggregates under continuous leaching (8.3 mmhos/cm). During the later leaching periods, the EC of the leachate for the large aggregates was higher than the other two sizes. Continuous leaching resulted in a lower EC for the first and a greater EC for the later saturation periods compared to the other two treatments. As for the individual salts, the migration pattern for K, Na, S, and C1 was similar to that for EC, however, the pattern for the other ions was dissimilar. (Skogerboe-Colorado State)
W77-00558

VARIABLE NATURE OF CHEMICAL COMPOSITION OF SEWAGE SLUDGES,
Purdue Univ., Lafayette, Ind. Inst. of Environmental Health; and Purdue Univ., Lafayette, Ind. Agricultural Experimental Station.
For primary bibliographic entry see Field 5A.
W77-00602

THE DELINEATION AND GROWTH OF A SLUDGE FIELD,
Institute of Oceanographic and Fisheries Research, Athens (Greece).
For primary bibliographic entry see Field 5C.
W77-00603

COMPLEXATION OF TRACE METALS BY ETHYLENEDIAMINETETRAACETIC ACID (EDTA) IN NATURAL WATERS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5A.
W77-00604

MUNICIPAL WATERSHED MANAGEMENT SURVEY,
Southeastern Area State and Private Forestry, Atlanta, Ga.; and Geological Survey, Atlanta, Ga.
C. E. Dissmeyer, and W. T. Swank.
American Water Works Association Journal, Vol. 68, No. 2, p 97-100, February, 1976. 10 tab, 5 ref.

Descriptors: *Watershed management, *Land use, *Water quality, *Forest management, Streamflow, *Southeast US, Recreation facilities, Information exchange, Municipal wastes, Surface waters, Surveys, *Forest watersheds.

A general summary of survey data on the nature and extent of land uses, management problems, and information needs for municipal watersheds in the southeastern United States is presented, with particular emphasis on small and heavily forested watersheds.Currently, more than half of the small forested watersheds are either totally or partially closed to use. On the remaining watershed that are open, recreational activities are predominant, with some timber-management activities also being conducted. Major problem areas in watershed management include water quality problems and problems associated with water quantity and seasonal distribution of streamflow. The first problem was reported by 41% of the watershed managers surveyed, and the latter two problems were reported by 22% and 28%, respectively, of the managers surveyed. Information on the effects of forest management activities on the quantity and timing of streamflow does not appear to be reaching water supply managers despite its availability. Additional research is needed to more clearly define the impact of forest practices on water quality. (Kreager-FIRL)
W77-00608

WATER TEMPERATURE SIMULATION,
Hydrocomp, Inc., Palo Alto, Calif.
G. T. Lum.
Simulation Network Newsletter, Vol. 8, No. 3, 8 p, May, 1976. 5 fig, 2 tab.

Descriptors: *Simulation analysis, *Water temperature, *Heat transfer, *Water pollution effects, Rivers, Model studies, *Columbia River, Mathematical models, Advection, Methodology, Nuclear power plants.

The methodology of water temperature simulation is reviewed and applied to a case study. Simulation of water temperature is based on the use of an artificial control volume. Changes in the heat content of the control volume are due to internal sources, internal sinks, or transport of the heat across control volume boundaries. The general methodology is to evaluate each individual effect, then sum the effects to arrive at the net overall change in heat content of the control volume. Temperature simulation of river systems is greatly simplified by the absence of internal sources and sinks of heat. Changes in the heat content are due only to the transport process of advection, diffusion and dispersion, and heat transfer across the water surface. The representation of advected heat is easily done if the model contains flow-routing procedures. The accurate representation of diffusion and dispersion involves several complications; however, these two parameters can be assumed negligible relative to advection. Transport of heat across the air-water interface involves a number of different mechanisms which cannot be predicted adequately. The usefulness of water temperature simulation is illustrated by evaluating the effects of a proposed nuclear power plant on the downstream thermal regime of the Columbia River System. (Kreager-FIRL)
W77-00616

THE NONPOINT SOURCE POLLUTANT LOADING (NPS) MODEL,
Hydrocomp, Inc., Palo Alto, Calif.
Y. J. Litwin, and A. S. Sonigian, Jr.
Simulation Network Newsletter, Vol. 8, No. 4, 4 p, July 1976. 4 fig, 4 ref.

Descriptors: *Computer models, *Overland flow, *Water pollution sources, *Simulation analysis, Surface runoff, Urban runoff, Surface waters, Model studies, Watershed management, Waste loading.
Identifiers: *Nonpoint pollution sources.

A computerized model for simulating nonpoint source pollutant loading is described. The model continuously simulates the hydrologic processes, including pollutant accumulation, generation, and washoff from the land surface as well as snow accumulation and melt. The model is limited in the sense that only land surface contributions to nonpoint source pollution are evaluated. Subsurface and groundwater pollutants as well as channel processes are not considered. The model is concerned with the total loading or pollutant input to a stream channel or waterbody from the land surface; for water quality evaluations in watersheds where in-stream processes are significant, the model must be interfaced with stream water quality models. Sample results of simulating overland flow quantity and quality for an urban watershed are presented and indicate that the model provides a viable means for assessing land surface contributions of nonpoint pollutants. Calibration of certain model parameters is a necessary and critical step when applying the model to a particular watershed since the model is limited by simplifications due to incomplete descriptions of the processes controlling nonpoint pollution. (Kreager-FIRL)
W77-00617

COMPUTERIZED CITY-WIDE CONTROL OF URBAN STORMWATER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5G.
W77-00634

NITROGEN TRANSFORMATIONS OF AMMONIUM SULFATE AND ALANINE IN SUBMERGED MAAHAS CLAY,
Philippines Univ., College. Coll. of Agriculture.
I. J. Manguiat, and T. Yoshida.
Soil Sci Plant Nutr. 19(2), p 95-102, 1973.

Descriptors: *Clays, *Denitrification, *Nitrification, Soil, *Aquatic soils, *Nitrogen, Sulfates, Asia, Path of pollutants, *Soil chemistry.
Identifiers: *Alinine, Ammonium sulfate, Maahas clay(Philipines).

The fate of added N in submerged soils was studied using 15N-labelled ammonium sulfate and alanine. After 8 wk of incubation at 25 and 22%, respectively, of N from ammonium sulfate and alanine were recovered in the soil. Under the experimental conditions used N added to presubmerged soils was lost rapidly outside of the soil-water system, regardless of whether the N was organic or inorganic. Fractionation studies revealed that the amount of tagged N incorporated into exchangeable ammonium, residual fractions, volatized as NH3 and chemically fixed N was not enough to account for the N loss. The N loss was attributed to nitrification and subsequent denitrification during the incubation period. The effect of N-Serve (2-chloro-6-(trichloromethyl) pyrimidine) on nitrification of 15N-labelled (NH4)2S04 in submerged soils was studied. About 15% more N was recovered from non-presubmerged soil, and less nitrate was accumulated in presubmerged soils where N-Serve coated (NH4)2S04 was applied, than from soils where (S4)2S04 was applied with N-Serve. Presubmerged soils provided a more favorable environment for nitrification than for denitrification under the experimental conditions used.--Copyright 1974, Biological Abstracts, Inc.
W77-00639

MANGANESE IN NARRAGANSETT BAY,
Rhode Island Univ. Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5A.
W77-00642

HEAT DISPERSION IN PHYSICAL ESTUARINE MODELS; REPORT 2, EXPERIMENTS IN THE DELAWARE RIVER MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
M. J. Trawle.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-021 952, Price codes: A07 in paper copy, A01 in microfiche. Research Report H-75-2, February 1976. 139 p, 109 fig, 4 tab.

Descriptors: *Model studies, *Heat, *Dispersion, *Delaware River, Hydraulic models, Powerplants, Thermal powerplants, Electric powerplants, Estuaries, Tides, Flow, Streamflow, Heat transfer, Temperature, *Thermal pollution, *Path of pollutants, Cooling water.
Identifiers: *Thermal plumes.

This report is the second of three to be published on the results of investigations of heat dispersion in physical estuarine models conducted in the Delaware River and Trinity Bay models for the Office, Chief of Engineers, U.S. Army. The results of this investigation indicated that the Delaware River physical model at the U.S. Army Engineer Waterways Experiment Station can be used effectively to predict the thermal plume characteristics from certain types of heated discharges into the Delaware Estuary. Specifically, the discharges investigated on the Delaware River were classified as low densimetric Froude number discharges, i.e., canals or low-exit-velocity pipe discharges. The near-field distortion effect was at a minimum in the model with this type of discharge. It was mentioned that no comparative tests of high densimetric Froude number discharges (diffusers) have been conducted in the model, and, therefore, it cannot be concluded from the investigation that the Delaware River model can adequately predict thermal plume characteristics for the latter-type discharge into the Delaware Estuary, nor are the results of this study readily transferable to other estuary models, especially those of dissimilar estuaries or those of different scales. (Sims-ISWS)
W77-00665

IMPROVING THE QUALITY OF WATER RELEASES FROM RESERVOIRS BY MEANS OF A LARGE DIAMETER PUMP,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. E. Garton, and C. E. Rice.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 548, Price code: A03 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, 1976. 34 p, 16 fig, 1 tab, 4 ref. OWRT C-5228(No. 4215)(1).

Descriptors: *Reservoir relases, *Pumps, *Pumping, Stratification, *Destratification, Water quality, Oxygen, Temperature, Reservoir operation, *Oklahoma, Lakes, Iron, Manganese, Dissolved soils, Ammonia, Hypolimnion.
Identifiers: *Lake Arbuckle(Okla), Axial flow pumps.

In temperate climates, many lakes stratify during the summer. A typical stratified lake will have a warm oxygen-rich epilimnion, a thermocline, and a colder oxygen depleted hypolimnion. High levels of iron, manganese, hydrogen sulfide, and ammonia and dissolved hydrocarbons may occur in the hypolimnion. Many efforts have been made to destratify lakes, primarily by air bubbling. These methods require large energy inputs. A low-energy destratifier using 42-inch propellers to pump the water downward from the surface has been used successfully to destratify a 100 acre lake (35 feet deep) for 3 years. This project was an attempt to apply the same kind of device to Lake Arbuckle, a 2400 acre, 90-feet deep lake in south central Oklahoma. A 16.5-foot aircraft propeller was used to pump approximately 200,000 gallons per minute downward. Although the lake stability index was decreased by half, a corresponding reduction in the oxygen distribution index did not occur until the fall overturn. Thus, a lake can be weakly stratified thermally and strongly stratified chemically. The fall turnover occurred about a month earlier and more completely than normal during two years of operation. The oxygen content in the outlet waters near the pump was increased 1 to 2 mg/L during the critical summer months. (See also W77-00669)
W77-00668

SEDIMENT CHARACTERISTICS AND THE TROPHIC STATUS OF FOUR OREGON LAKES,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
G. E. Davis, and G. L. Larson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 560, Price codes: A04 in paper copy, A01 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-46, September 1976. 56 p, 11 fig, 10 tab, 64 ref. OWRT A-027-ORE(1).

Descriptors: Trophic level, *Paleolimnology, *Lakes, Sediments, *Eutrophication, *Lake sediments, *Oregon, Organic matter, Chlorophyll, Phosphorus, Nitrogen, Diatoms, Watersheds(Basins), Biodegradation, *Sedimentation rates, Indicators.
Identifiers: *Sedimentary chlorophyll degradation products, Waldo Lake(Ore), Odell Lake(Ore), Diamond Lake(Ore), Devil's Lake(Ore).

This study was undertaken to evaluate the usefu
ness of sediment records for correlating changes
the sediment characteristics of four Oregon lak
with past cultural developments of the lakes a
their watersheds. The lakes were Waldo, Odell a
Diamond Lakes located in the Cascade Mountai
and Devils Lake located on the Oregon coast. Pe
centage dry weight, percentage organic matte
sedimentary chlorophyll degradation produc
(SCDP), total phosphorus, total organic nitroge
and diatom assemblages were used as indices
sediment changes through time. Profiles
selected characteristics of the sediment cor
reflected the events unique to each lake and
watershed.
W77-00673

AN AQUEOUS ENVIRONMENTAL SIMUL
TION MODEL FOR MID-SOUTH LAKES AN
RESERVOIRS,
Arkansas Univ., Fayetteville. Coll. of Enginee
ing.
For primary bibliographic entry see Field 5C.
W77-00675

MEASUREMENT OF URBAN RUNOI
PETROLEUM,
Rutgers - The State Univ., New Brunswick, N.
Dept. of Environmental Science.
J. V. Hunter, S. L. Yu, and W. Whipple, Jr.
In: Urbanization and Water Quality Contr
Proceedings No. 20, American Water Resourc
Association, Minneapolis, Minn., June 1975,
162-168. 2 fig, 3 tab, 3 ref. Edited by W. Whippl
Jr.

Descriptors: Water quality, Water pollut
sources, Oil pollution, *Oil waste
*Measurement, Organic compounds, Effluent
Pennsylvania, Water analysis, Sampling, Trea
ment facilities, *Industrial wastes, Water pollut
control.
Identifiers: *Urban runoff, *Nonpoint pollut
sources, Philadelphia(Penn).

Interim results are presented for the measureme
and analysis of petroleum hydrocarbons in urb
runoff. Numerous samples were taken for analy
through the storm hydrograph. Runoff from a rel
tively clean Philadelphia neighborhood showed
weighted mean concentration of 2.63 mg/l. Th
compares with average content of 1.56 mg/l
several samples of treated petroleum refinery e
fluent. Projections indicate that when refine
treatment plants now planned are all operable, t
urban runoff may have considerably more to
petroleum content than the refinery effluent.
W77-00678

EXPERIMENTS TO INVESTIGATE SUBSTA
TIAL LOAD OF SOILS AND TO PREDICT TH
LONG TERM EFFECTS OF WASTES O
GROUND WATER, (IN GERMAN),
Ministry of Agricultural Experiment Statio
Brunswick (West Germany).
N. El-Bassam.
Landwirtsch Forsch 28(3), p 175-182, 1975.

Descriptors: Percolation, Groundwater, Soil
Waste disposal, Path of pollutants, *Sewag
disposal fields, *Soil contamination, Soil analysi
Migration, Electrical conductance, Heavy metal
Mineralogy.
Identifiers: Mineral content(Soils).

Percolation and migration experiments have be
carried out since 1973 with and without radioacti
isotopes on undisturbed soil column from sewag
treated fields, to determine the mineral load
contaminated soils and to predict a possible lo
term effects of addition of wastes to soil on grou
water. The electrical conductivity of the leache
material from the contaminated soil columns i
dicated that it was higher (2.6 mmho/cm) than t
control (0.05). The mineral contents NO2, NO3,

Cl, Na, K, Ca, Mg and the heavy metals Zn and Cd were higher. Results of soil analysis confirm results of the percolation experiments concerning substantial load. Under given experimental conditions, the Zn migration rate was 10.8 cm/yr.--Copyright 1976, Biological Abstracts, Inc.
W77-00703

THE ROLE OF SEDIMENT AS A MODIFYING FACTOR IN PESTICIDE-ALGAE INTERACTIONS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-00713

SEASONAL FLUCTUATIONS OF DIELDRIN RESIDUES IN THE TISSUES OF THE MARSH CLAM, RANGIA CUNEATA, FROM A TEXAS ESTUARY,
Texas A and M Univ., College Station.
S. R. Petrocelli, J. W. Anderson, and A. R. Hanks.
Texas Journal of Science, Vol. 26, No. 3-4, p 443-448, 1975.

Descriptors: *Pesticide residues, *Fluctuations, *Dieldrin, *Clams, *Seasonal, *Texas, Commercial shellfish, Bioindicators, Path of pollutants, Water pollution effects.
Identifiers: Rangia cuneata, *Trinity Bay(Texas).

The marsh clam, Rangia cuneata, was collected in Trinity Bay, Texas, in 1970 and 1971 and analyzed for residues of the chlorinated hydrocarbon insecticide, dieldrin, by gas-liquid chromatography. Analysis was carried out on ten individual clams randomly selected, shucked, and frozen. Recoveries of dieldrin from fortified clam tissue samples were above 85%. Clams collected in October and December 1970 had lower residues of dieldrin (mean and standard deviations were 7.9 plus or minus 1.5 ppb and 6.8 plus or minus 1.1 ppb, respectively) than those for February, April, and July (mean and standard deviations were 16.4 plus or minus 2.8 ppb, 16.6 plus or minus 1.4 ppb and 14.8 plus or minus 1.8 ppb respectively), or at least twice the fall values. These seasonal fluctuations in insecticide residues in tissue may be due to changes in river flow into the bay, with maximum tissue levels in months of large freshwater input. Also maturation of gonads and production of gametes in the spring and summer may cause higher whole body insecticide residue levels during these periods. (Buchanan-Davidson--Wisconsin)
W77-00717

NUMERICAL MODELS OF LAKE CURRENTS,
Case Western Reserve Univ., Cleveland, Ohio.
W. Lick.
Report EPA-600/3-76-020, April 1976. 151 p. 61 fig., 80 ref. R-802359.

Descriptors: *Hydrodynamics, *Littoral, *Mathematical models, *Lakes, *Currents(Water), Water pollution, Dispersion, *Lake Erie, Water circulation, Storm surge, Thermal pollution, Spatial distribution, Effluents, Influent streams, Mixing, Diffusion, Model studies, *Path of pollutants.

To understand fundamental aspects of contaminant dispersion in near-shore regions of large lakes and realistically describe currents, numerical models were developed. One steady-state, constant-density model was applied to overall circulation in Lake Erie, circulation when partially ice-covered, and circulation in a near-shore area (including a proposed jetport), plus a two-layer stratified lake. A second model is time-dependent, constant-density, free-surface model, to describe storm surges and similar motions. It was applied to storm surges in Lake Erie and a near-shore area. The third model is a time-dependent, variable-density, rigid-lid model which was used on river discharges, thermal plumes, and overall and near-shore circulation in a stratified lake. Vertically averaged models, which were relatively simple but did not give details in the vertical of the flow and caused errors in small time and variable-depth situations were used for parametric studies, lake circulation problems, river discharges, and thermal plumes. There models are sufficiently accurate to be used as bases for models of sediment resuspension and transport, dredging, plankton growth, community succession, etc. These numerical models do not consider wave effects. (Buchanan-Davidson--Wisconsin)
W77-00722

WATER POLLUTION INVESTIGATION: MAUMEE RIVER AND TOLEDO AREA,
Enviro Central, Inc., Rockville, Md.
For primary bibliographic entry see Field 5C.
W77-00723

THE INFLUENCE OF LAND USE ON STREAM NUTRIENT LEVELS,
Corvallis Environmental Research Lab., Oreg. Eutrophication Survey Branch.
For primary bibliographic entry see Field 5C.
W77-00725

THE POTENTIAL CONTRIBUTION OF FERTILIZERS TO WATER POLLUTION,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
L. A. Douglas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 609, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Research Institute, Rutgers University, New Brunswick, N. J. Partial Completion Report, June 1976. 92 p, 50 fig, 16 tab, 45 ref. OWRT A-027-NJ(6). 14-31-0001-3830.

Descriptors: *Nitrates, *Nitrites, *Ammonia, *Phosphates, *Leaching, *Fertilizers, Land use, *New Jersey, *Denitrification, Nitrogen, Nutrients, Water pollution sources.
Identifiers: N-SERVE.

Field studies were undertaken to determine the magnitude of leaching of fertilizer N03, NH4 and P04. The effect of N-SERVE on these reactions was observed, N-SERVE had little effect on leaching because most leaching takes place during the fall and winter when precipitation exceeds evapotranspiration. No leaching of NH4 or P04 was observed. The common fertilizer efficiency measure of N in crop/N applied in fertilizer may be used as an indication of the amount of fertilizer N that will be leached. Studies of nutrients in streams were undertaken to relate land use to N03, NH4 and P04 concentrations in surface waters. Sewage treatment plants and 'illegal drains' were major sources of all three ions. In order of decreasing contribution of N03: urban land contributes more than cropland which contributes more than woodlands. Urban lands, croplands and woodlands contribute equal amounts of NH4 and P04 to streams. The 'background level' of P04 in central New Jersey streams is many times higher than the 0.01 ppm level often advocated. Although very high concentrations of N03 were found in the soil solution in the subsoil the concentration of N03 found in streams was rather low. Denitrification must be an active process in subsoils, and probably in the groundwater.
W77-00732

HYDRAULIC MODEL STUDIES OF NAVAJO DAM AUXILIARY OUTLET WORKS AND HOLLOW-JET VALVE BYPASS--MODIFICATIONS TO REDUCE DISSOLVED GAS SUPERSATURATION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8C.
W77-00739

EVALUATING IMPACT OF FOREST SITE PREPARATION ON SOIL AND WATER QUALITY IN THE U.S. GULF COASTAL PLAIN,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
D. C. McClurkin, and P. D. Duffy.
In: Forest Soils and Forest Land Management. Proceedings of the Fourth North American Forest Soils Conference, 1973, Quebec, p 315-321. 1975. 32 ref. Edited by B. Bernier and C. H. Winget.

Descriptors: *Forest management, *Water quality, Water quality standards, Watershed management, Soil physical properties, Coastal Plains, *Mississippi.
Identifiers: *Site preparation, *Site productivity, *Gulf Coastal Plain.

If projected U.S. timber needs of the year 2000 are to be met, at least 4 million hectares of bare or poorly stocked southern forest land must be planted with pine by 1985, and another 8 million hectares must be converted from low-grade hardwoods to pine. To meet these goals, land managers annually are drastically disturbing many thousands of hectares by tree crushing, brush chopping, disking, windrowing, bedding, burning, and chemical treatment to remove competing vegetation and prepare the soil for pine. Though evidence is limited, literature on past forest and agricultural practices resembling such intensive techniques indicates that there may be reason for concern. The environmental values at stake suggest research to determine (1) what significant changes in soil and water quality result from intensive forestry; (2) whether changes are adverse; and (3) if adverse, how practices can be modified to allow management for high yields without damaging impacts. Described are some of the considerations involved in such research, including initial survey and development of a sampling scheme. (Forest Service)
W77-00740

THE DILEMMAS OF SETTING SEDIMENT STANDARDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-00806

NUTRIENTS LOST IN DEBRIS AND RUNOFF WATER FROM A BURNED CHAPARRAL WATERSHED,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W77-00810

PHYSICAL AND CHEMICAL CHARACTERISTICS OF SEDIMENTS ORIGINATING FROM MISSOURI VALLEY LOESS,
Agricultural Research Service, Cheyenne, Wyo. North Central Region.
G. E. Schuman, R. F. Piest, and R. G. Spomer.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 3-28 - 3-40, 1976. 3 fig, 5 tab, 18 ref.

Descriptors: *Sediments, *Chemical properties, *Agricultural runoff, *Iowa, Nitrogen, Phosphorus, Carbon, Nutrients, Chemicals, Agricultural chemicals, Fertilizers, Erosion, Gully erosion, Rill erosion, Sheet erosion, Soil erosion, Loess, Soils, Suspended solids, Clays, Silts, Sands, Surface runoff, Sedimentation, Sedimentology.

Nitrogen (N) and phosphorus (P) associated with sediment in surface runoff accounted for at least 85% of N and P discharged from agricultural watersheds. The N and P content of the sediment was related to its carbon (C) content. At low flow,

the C concentration of the sediment increased, indicating the selectivity of the erosion process for organic material. The sediment showed an enrichment in the clay fraction over that contained in the surface soil, and this increase can result in a disproportionate increase in the discharge of those chemicals adsorbed to clay material. (See also W77-00775) (Sims-ISWS)
W77-00811

SEDIMENT-PHOSPHORUS RELATIONS IN SURFACE RUNOFF FROM IRRIGATED LANDS,
Agricultural Research Service, Kimberly, Idaho. Soil and Water Conservation Research Div.
D. L. Carter, M. J. Brown, and J. A. Bondurant.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 3-41 - 3-52, 1976. 8 tab, 11 ref.

Descriptors: *Sediments, *Phosphorus, *Irrigation, *Agricultural runoff, Erosion, Soil erosion, Nutrients, Irrigation practices, Suspended solids, Soils, Loam, Silts, Regression analysis, Chemicals, Chemistry, Sedimentation.

Phosphorus and sediment concentrations were measured in irrigation and drainage waters, and phosphorus and sediment inflows and outflows computed. Relationships between phosphorus and sediment were developed. Total phosphorus and orthophosphate concentrations measured in nonfiltered samples were closely related to the sediment concentration, but dissolved orthophosphate measured in samples filtered through 0.45 micrometer membrane filters was independent of the sediment concentration. A net sediment inflow was found on one large tract where sediment settles in drains and the amount of surface runoff is low, but a net sediment outflow was found for another tract with steeper drains and from which more surface runoff returned to the river. Net phosphorus inflows were measured on both tracts. Particle size segregation took place in irrigation and drainage waters whenever the flow velocity was slow enough to allow suspended sediment to settle, and the quantity of phosphorus per unit of sediment remaining suspended increased. Actually, much more phosphorus settles with that portion of the sediment that settles than remains in suspension where sediments are eroded from silt loam or loam soils. Thus, conditions favoring settling were phosphorus-conserving conditions. (See also W77-00775) (Sims-ISWS)
W77-00812

PESTICIDE CONCENTRATIONS AND YIELDS IN RUNOFF AND SEDIMENT FROM A MISSISSIPPI DELTA WATERSHED,
Agricultural Research Service, Baton Rouge, La.
G. H. Willis, L. L. McDowell, J. F. Parr, and C. E. Murphree.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 3-53 - 3-64, 1976. 5 fig, 2 tab, 7 ref.

Descriptors: *Pesticides, *Sediments, *Agricultural runoff, *Soil erosion, *Mississippi, DDT, DDE, Rainfall, Runoff, Erosion, Agricultural chemicals, Cotton, Crops, Farm management, Watersheds(Basins), Sediment yield, Regression analysis.
Identifiers: *Mississippi delta, Toxaphene, Trifluralin.

Pesticide concentrations were measured in runoff from a 15.6-ha (38.5-acre) watershed planted to continuous cotton. The watershed, consisting of Sharkey silty clay soil, had been formed for drainage with mean slopes of 0.2%. Measurements during 1973 and 1974 indicated a linear relationship between pesticide yields in runoff and sediment yields. Mean sediment yield was 27.6 metric tons/ha/year (12.3 tons/acre) when mean annual rainfall was 43.8 cm (17.2 inches) above the 30-year average of 125 cm (49.4 inches). Toxaphene, DDT, DDE, and trifluralin yields from the watershed in 1973, when no toxaphene or DDT was applied, were 117 (0.104), 87 (0.078), 7 (0.006), and 2 (0.002) g/ha (lbs/acre), respectively. Corresponding yields in 1974, when 10.08 kg toxaphene/ha (9 lbs/acre) were applied, were 97 (0.086), 27 (0.024), 6 (0.005), and 2 (0.002) g/ha (lbs/acre), respectively. In 1974, the mean annual concentrations of toxaphene, DDT, DDE, and trifluralin in runoff were approximately 11, 3.1, 0.6, and 0.2 microgram/liter (ppb). These sediment and pesticide yields are probably higher than would be expected in a year of normal rainfall amount and distribution. The data indicated the need, however, for improved erosion control practices on flat lands in the Delta to reduce the loss of valuable topsoil and to reduce pollution hazards from both sediment and farm chemicals. (See also W77-00775) (Sims-ISWS)
W77-00813

ROLE OF THE SEDIMENTATION IN THE SELF-PURIFICATION OF THE SCHELDT ESTUARY,
Laboratoire de Recherches Hydrauliques, Antwerp (Belgium).
J. J. Peters, and R. Wollast.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D. C., Sedimentation Committee, p 3-77 - 3-86, 1976. 6 fig, 2 ref.

Descriptors: *Estuaries, *Sedimentation, *Pollutants, *Belgium, Heavy metals, Water pollution, Path of pollutants, Salinity, Sediments, Bottom sediments, Nutrients, Diatoms, Oxygen, Organic matter, Turbidity, Suspended solids, Rivers, Saline water-freshwater interfaces, *Self purification.
Identifiers: *Scheldt Estuary(Belgium).

The hydrographic basin of the Scheldt River covers a heavily populated and industrialzed region and drains waters extremely polluted due to uncontrolled discharges. In this partially stratified estuary, the mixing process of fresh and salt water is responsible for an important deposition of the suspended load of the river in a restricted area corresponding to the harbor of Antwerp. This important shoaling is explained by the physico-chemical properties of the suspended matter and the hydrodynamical characteristics of the estuarine region. Taking into account the physical characteristics of the Scheldt, the estuary was divided into two zones: an upper one from km 100 to km 55 and a lower one from km 55 to the mouth. Four times a year fixed stations situated at the boundaries of these regions were managed during 5 days; hourly samples were taken at three depths and continuous measurements of the profile of the currents along a vertical were performed. A longitudinal survey was also executed monthly, following the low tide from the mouth to km 130. Approximately 50 surface samples were collected during each survey. The mechanisms and characteristics of the mud deposition and their influence on the mass-transport, the accumulation, and the transformation of some typical elements in the estuarine zone of the Scheldt were presented. Observations over three years enabled the annual mass balances of input, transport, and accumulation by sedimentation of various pollutants in the two estuarine regions to be estimated. The role of the sediments on the oxygen budget was deduced from the previous mass-balances. Large concentrations of nutrients persisted in the brackish water zone where oxygen was available and turbidity was low. As a consequence, this zone was eutrophied and diatom blooms were frequent. (See also W77-00775) (Sims-ISWS)
W77-00815

SEDIMENT DISPERSAL IN WESTERN LAKE MICHIGAN NEAR TWO CREEKS, WISCONSIN, AND THE INFLUENCE OF AN INDUSTRIAL COOLING WATER DISCHARGE,
Wisconsin Univ., Madison. Sea Grant Program; and Wisconsin Univ., Madison. Geo-Environmental and Mineral Resources Program.
For primary bibliographic entry see Field 2J.
W77-00841

SIMULATION OF DISSOLVED OXYGEN AND BIOCHEMICAL OXYGEN DEMAND PLANTATION CANAL, BROWARD COUNTY, FLORIDA, WITH AN EVALUATION OF THE QUAL-I MODEL FOR USE IN SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
T. N. Russo, and R. S. McQuivey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 375/, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 59-75, December 1975. 49 p, 15 fig, 7 tab, 13 ref.

Descriptors: *Mathematical models, *Dissolved oxygen, *Biochemical oxygen demand, *Canals, *Water quality control, Reaeration, Sewage effluents, Photosynthesis, Water management(Applied).
Identifiers: *Plantation canal(Fla), *Broward County(Fla).

A mathematical model; QUAL-I, developed by the Texas Water Development Board, was evaluated as a management tool in predicting the spatial and temporal distribution of dissolved oxygen and biochemical oxygen demand in Plantation Canal. Predictions based on the QUAL-I model, which was verified only against midday summer-flow conditions, showed that improvement of quality of inflows from sewage treatment plants and use of at least 130 cubic feet per second of dilution water would improve water quality in the canal significantly. The model was not fully amenable to use on Plantation Canal because: (1) it did not consider photosynthetic production, nitrification, and benthic oxygen demand as sources and sinks of oxygen; (2) the model assumptions of complete mixing, transport, and steady state were not met; and (3) the data base was inadequate because it consisted of only one set of data for each case. However, it was felt that meaningful results could be obtained for some sets of conditions. (Woodard-USGS)
W77-00852

SOURCES OF ARSENIC IN STREAMS TRIBUTARY TO LAKE CROWLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
L. A. Eccles.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 856, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-36, June 1976. 39 p, 6 fig, 9 tab, 21 ref.

Descriptors: *Water pollution sources, *Trace elements, *Water quality, *Hot springs, *California, Water analysis, Surface waters, Lakes, Chemical analysis, Water chemistry, Geochemistry, Geothermal studies, Path of pollutants, Water supply, Public health.
Identifiers: *Arsenic, *Lake Crowley(Calif), Los Angeles(Calif).

Lake Crowley is the largest single source of water for the city of Los Angeles. More than 50 percent of the water entering the Los Angeles-Owens River aqueduct flows through Lake Crowley. Arsenic enters Lake Crowley primarily from hot springs in Long Valley. Sixty percent of the arsenic discharged to Lake Crowley is from hot springs in Hot Creek Gorge. The hot-spring water containing about 1,000 micrograms per liter of arsenic blends with the water flowing in the creek and is usually diluted to a concentration of about

micrograms per liter; additional dilution oc-
s downstream. About 75 percent of the arsenic
Hot Creek is discharged from only two springs.
remaining sources of arsenic in the gorge are
rly defined seepage and flow from numerous
ll springs. Other sources of arsenic in Long
ley are from either high volume and low-ar-
ic concentration springs, such as the springs at
Creek Fish Hatchery, or high-concentration
low-volume springs, such as those found in
vicinity of the Alkali lakes. These other
rces individually are small in comparison with
source in Hot Creek Gorge. It is unlikely that
nic from these sources could cause the arsenic
centration in Lake Crowley to exceed the En-
nmental Protection Agency's recommended
erion (limit) for public water supply.
oodard-USGS)
7-00867

DRAZINE DEGRADATION IN AQUATIC STEMS,
rospace Medical Research Lab., Wright-Patter-
AFB, Ohio.
primary bibliographic entry see Field 5C.
7-00879

DIMENT MOVEMENT INDUCED BY SHIPS RESTRICTED WATERWAYS,
xas A and M Univ., College Station. Ocean En-
eering Program.
primary bibliographic entry see Field 2L.
7-00886

FLUENCE OF THE SUPRAMOLECULAR ARINE ENVIRONMENT ON PITTING COR-SION,
xas A and M Univ., College Station. Ocean En-
eering Program.
primary bibliographic entry see Field 8G.
7-00890

PORT TO THE CONGRESS ON OCEAN MPING RESEARCH, JANUARY THROUGH CEMBER 1975.
tional Oceanic and Atmospheric Administra-
n, Washington, DC.
primary bibliographic entry see Field 5G.
7-00892

ARINE POLLUTION ARTICLES IN THE LAW THE SEA SINGLE INFORMAL NEGOTIAT-G TEXT,
ode Island Univ., Kingston. Law of the Sea
t.
primary bibliographic entry see Field 5G.
7-00894

VESTIGATIONS INTO THE VERTICAL DIS-IBUTION OF ORGANISMS AND CHEMICAL BSTANCES IN THE GROUNDWATER IN LLEYS AND TERRACES: METHODS AND RST RESULTS, (IN GERMAN),
x-Planck-Institut fuer Limnologische Schlitz
est Germany). Limnologische Flusstation.
primary bibliographic entry see Field 5A.
7-00919

UNICIPAL PHOSPHORUS LOADINGS TO KE ERIE, AN EVALUATION STUDY EPARED FOR THE GREAT LAKES WATER ALITY BOARD.
ernational Joint Commission-United States and
nada, Windsor (Ontario). Great Lakes Water
ality Board.
cember 1975. 40 p, 2 fig, 4 tab, append.

scriptors: *Phosphorus, *Lake Erie, *Sewage
luents, Water pollution sources, Treatment
ilities, Sludge treatment, Nutrient removal,
passes, Combined sewers, Storm water, Biochemical oxygen demand, Suspended solids, Michigan, Ohio, Indiana, Pennsylvania, Canada, *Organic loading.
Identifiers: *Phosphorus loadings, Ontario, Detroit(Mich), Cleveland(Ohio), Toledo(Ohio), Akron(Ohio), Erie(Ohio), Fort Wayne(Ind), Windsor(Ontario), London(Ontario), Kitchener(Ontario).

In an effort to determine the 1974 annual phosphorus loadings to Lake Erie, treatment plants in Detroit, Cleveland (Easterly, Southerly and Westerly), Toledo, Akron, Wyandotte, Erie, Fort Wayne, Windsor, London and Kitchener were visited and their operational efficiencies evaluated. Another objective was to assess the pollution loadings from plant bypasses and combined sewer overflows. The overall performance of each of the treatment plants in 1973 and 1974 is summarized and the average concentrations for phosphorus, BOD and suspended solids are shown. Seven of the 12 plants had not achieved the phosphorus concentration of 1 mg/l in their effluents despite the fact that they have installed phosphorus-removal facilities. Unmonitored sewage bypasses within the plants do not appear to constitute a significant portion of the phosphorus loading; there were insufficient quanitative data on combined sewer and stormwater overflows. The most frequent cause of operational problems experienced was inadequate sludge handling facilities but remedial actions were underway. When the targeted phosphorus reduction levels are achieved the total phosphorus loadings will be reduced from 18,000 to 5,700 kg/day, a decrease of almost 70%. (Auen-Wisconsin)
W77-00926

ASBESTOS IN THE GREAT LAKES BASIN WITH EMPHASIS ON LAKE SUPERIOR, A REPORT TO THE INTERNATIONAL JOINT COMMISSION FROM THE GREAT LAKES RESEARCH ADVISORY BOARD.
International Joint Commission-United States and Canada, Windsor (Ontario). Great Lakes Water Quality Board.
February 1975. 101 p, 14 fig, 15 tab, 36 ref, 5 append.

Descriptors: *Asbestos, *Lake Superior, Water pollution, Air pollution, St. Lawrence River, Great Lakes, International Joint Commission, Waste water treatment, Mineraology, Minnesota, Mining, Analytical techniques, Judicial decisions, Spatial distribution, Bottom sediments, Waste water(Pollution), Monitoring, Public health, Hazards.
Identifiers: *Reserve Mining Co., *Silver Bay(Minn), Duluth(Minn), Taconite mining.

Beginning with a description of asbestos properties and its analytical enumeration and identification, asbestos pollution is discussed in the context of medical research and human health hazards. Research on the distribution of asbestos in aqueous suspensions, in potable water, in air, and in Lake Superior sediments is summarized, as well as asbestos areal distribution in Lake Superior and the Great Lakes and concommitant biological aspects. Specific research needs are delineated particularly as related to (1) counting and identification methods, (2) sampling programs, (3) public health hazards and hazards to aquatic organisms resulting from asbestos ingestion and sedimentation, and (4) the necessity to quantify and characterize trans-boundary asbestos pollution. Appendices detail the taconite mining and beneficiation process, the water requirements and waste water disposal practices of the Reserve Mining Company at Silver Bay Minnesota: the chronology of the Reserve Mining case through the various state and federal agencies and the courts; the International Joint Commission's hearings, and the current monitoring programs. The final appendix reprints the U.S. Eighth Circuit Court of Appeals decision and the presiding judge's essential Findings of Fact and Conclusions of Law. (Auen-Wisconsin)
W77-00927

WATER POLLUTION INVESTIGATION: BLACK RIVER OF NEW YORK.
Hydroscience, Inc., Westwood, N. J.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 019, Price codes: A05 in paper copy, A01 in microfiche. Report EPA 905/9-74-009, December 1974. 107 p, 21 fig, 13 tab, 5 ref, 3 append. EPA 68-01-1573.

Descriptors: *Lake Ontario, *Rivers, *Water pollution, *New York, *Water pollution control, Model studies, Dissolved oxygen, Sewage effluents, Industrial wastes, Municipal wastes, Biochemical oxygen demand, Low flow, Water quality standards, Reaeration, Waterfalls, Dams, River flow, Effluents, Biota, Projections.
Identifiers: *Black River(NY), Moase River(NY), Beaver River(NY).

A dissolved oxygen model was used to project the effect of proposed wastewater discharges on dissolved oxygen levels of the Black River, New York, which terminates in Lake Ontario. These discharges represent the best practical control technology presently available for industries and conventional secondary treatment for municipalities. New York dissolved oxygen standards will be met for design low flow conditions. Dissolved oxygen levels between Lyons Falls and Carthage were below the standard. Dissolved oxygen measurements upstream showed a background dissolved oxygen deficit not associated with direct waste water discharges. Of the ultimate biochemical oxygen demand discharged to the Black River and its tributaries, 85% was from industrial sources and 15% from municipalities. The Black River is reoxygenated by flows over dams and natural falls. Dissolved oxygen levels should be determined to define the magnitude and spatial distribution of the background deficit and its relation to agricultural runoff or seasonal variations. The degree of aeration and factors such as dam height, river flow, and temperature should be correlated. Because of a discrepancy between measured and computed river BOD concentrations it is recommended that the BOD oxidation mechanism in the Black River be further investigated. (Buchanan-Davidson--Wisconsin)
W77-00929

AN APPROACH TO A RELATIVE TROPHIC INDEX FOR CLASSIFYING LAKES AND RESERVOIRS. (A PRELIMINARY ANALYSIS OF NATIONAL EUTROPHICATION SURVEY DATA COLLECTED DURING THE 1972 SAMPLING PERIOD).
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-00930

NITROGEN AND PHOSPHORUS IN WASTEWATER EFFLUENTS. (A PRELIMINARY ANALYSIS OF NATIONAL EUTROPHICATION SURVEY DATA COLLECTED DURING 1972-73 SAMPLING PERIOD).
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-00931

ERAMS SURFACE AND DRINKING WATER COMPONENTS, JANUARY--MARCH 1974.
Office of Radiation Programs, Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W77-00954

RADIOACTIVITY IN KANSAS SURFACE WATERS, JANUARY--DECEMBER 1972.
Kansas State Board of Health, Topeka. Radiation Control Section.
For primary bibliographic entry see Field 5A.
W77-00955

NONPOINT POLLUTION: AN EPA VIEW OF AREAWIDE WATER QUALITY MANAGEMENT,
Environmental Protection Agency, Washington, D. C. Water Planning Div.
For primary bibliographic entry see Field 5G.
W77-00959

DETOXIFYING INDUSTRIAL WASTEWATERS.
For primary bibliographic entry see Field 5D.
W77-00965

PELAGIC TAR,
J. Butler.
Scientific American, Vol 232, No 6, p 90-97, June 1975. 8 p, 2 illus, 2 photo, 5 chart.

Descriptors: *Oil wastes, *Ships, *Oceans, *Water pollution sources, *Ocean circulation, Surface waters, Tides, Oil pollution, Oil spills, Oily water, Fuels, Bacteria, Benthic fauna, Research priorities, Data collections, International commissions, Water quality control.
Identifiers: *Pelagic tar.

The term 'pelagic tar' describes tarry residues of petroleum that are found on the surface of the ocean. In recent years there has been great concern that pelagic tar deposits, which mainly come from the discharge of waste by tankers, are rapidly polluting the oceans. At the least they are breeding grounds for oxygen-eating bacteria. At worst, they may result in disruption of the ocean's ecosystem. This article examines the characteristics, disintegration rates, and effects on other organisms of pelagic tar. Due to a lack of data, no definite conclusions are reached. However, there is a chance that critical damage to subtle chemical communication signals between ocean organisms may have already begun. Thus, the dumping of petroleum wastes should be stopped immediately by whatever international sanctions are available. (Frank-Florida)
W77-00969

OF PCB PPMS FROM GE AND A SNAFU FROM EPA AND DEC,
For primary bibliographic entry see Field 5A.
W77-00978

SHIGELLA RESEARCH IN THE SEA AND IN AN ESTUARY: I. FREQUENCY OF BACTERIOPHAGES IN POLLUTED WATER, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
Z. Dartevelle, and L. Desmet.
Ann Microbiol (Paris) 126B(1), p 95-97, 1975.

Descriptors: *Shigella, E coli, Estuaries, Bacteria, *Bacteriophage, Bays, Europe, Sampling, Water pollution sources, *Path of pollutants.
Identifiers: Italy, Shigella-sonnei, Yugoslavia, *Bay of Trieste(Italy), *Adriatic Sea(Yugoslavia), *River Isonozo(Italy).

Water samples in the Bay of Trieste, Italy, were taken from the bay receiving the city waste waters, the river Isonzo and the Adriatic Sea along the Yugoslav coast. The bay waters were particularly polluted, 95% of samples containing bacteriophages specific for Escherichia. coli B., E. coli 125 and Shigella sonnei YCD. S. sonnei comprises 80% of the shigellas currently isolated in Europe. (See also W77-01021 and W77-01022)--Copyright 1976, Biological Abstracts, Inc.
W77-01020

SHIGELLA RESEARCH IN THE SEA AND IN AN ESTUARY: II. ATTEMPT TO INHIBIT THE ADSORPTION OF SHIGAPHAGES AND STUDIES OF SHIGELLA ON A SELECTIVE MEDIUM, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
Z. Dartevelle, and L. Desmet.
Ann Microbiol (Paris) 126B(1), p 99-100, 1975.

Descriptors: *Shigella, Estuaries, Europe, Adsorption, Bacteria, Inhibition, Path of pollutants, Water pollution sources.
Identifiers: *Shigaphages, *River Ysar estuary(Belgium).

Two different bacteriological methods were tried in an attempt to identify the presence of Shigella organisms in sea water and in the Nieuwpoort channel, estuary of the river Ysar in Belgium. By 1 method, involving glycerin addition to the water to attenuate shigaphages, no Shigella were demonstrated although they probably were present in sewer water. Using the other method, with XLD medium, no shigellas were found. The lack of success may be due to the dissemination of bacteria in a hostile environment and to the presence of a competitive, possibly inhibitory, flora. (See also W77-01020 and W77-01022)--Copyright 1976, Biological Abstracts, Inc.
W77-01021

SHIGELLA RESEARCH IN THE SEA AND IN AN ESTUARY: III. IN VITRO DETERMINATION OF THE SURVIVAL TIME OF SHIGELLA SONNEI YCD IN SEA WATER, (IN FRENCH),
Inst. R. Sci. Nat. Belg., Bruxelles, Belg. Institut Royal des Sciences Naturelles de Belgique, Brussels.
Z. Dartevelle, and L. Desmet.
Ann Microbiol (Paris) 126B(1), p 101-103, 1975.

Descriptors: *Shigella, Estuaries, Sampling, Path of pollutants, Mortality, Laboratory tests, Water pollution sources.
Identifiers: *Shigella-Sonnei.

S. sonnei YCD were incorporated in freshly collected sea water, stored at refrigerator temperatures for 2 h-15 days then recuperated by bacteriologic techniques. Concentrations of 1 Shigella organsm/ml survived 6-24 h; 100 organisms/ml survived 8-10 days and 10,000 shigellae/ml survived 4-8 days. Despite the negative results of previous attempts to isolate Shigella organisms from sea water and bay water, the recuperation of Shigella from a marine environment is possible. (See also W77-01020 and W77-01021)--Copyright 1976, Biological Abstracts, Inc.
W77-01022

SANITARY AND HYGIENIC EVALUATION OF THE QUALITY OF UNDERGROUND DRINKING WATER, (IN RUSSIAN),
Municipal Sanitary Epidemiology Station, Zhukovskii (USSR)
M. P. Vasil'Ev, and T. V. Laikhter.
Gig Sanit 3, p 110-111, 1975.

Descriptors: *Water quality, *Potable water, Public health, Bacteria, *Artesian wells, Water wells, Bioindicators, Confined water, Subsurface water.
Identifiers: Russian-Sfsr.

Ten - year observations of drinking water from artesian wells in the city of Zhukovskii (Russian SFSR, USSR) showed that the bacteriological indices (including coli titer) have remained stable at the level of the water quality standards. In the well water there have been changes in the mineral composition, hardness and content of Fe, sulfates, chlorides and ammonium N. The stability of the bacteriological indices indicates the absence of surface and deep subsurface water pollution sources. Changes of chemical composition in some artesian wells are due to geologic processes occurring in subsurface aquifers.--Copyright 1976, Biological Abstracts, Inc.
W77-01023

HYGIENIC INVESTIGATIONS OF A CASE RIVER POLLUTION BY CHEMICAL PLA WASTEWATERS, (IN RUSSIAN),
B. S. Pankratov, A. I. Chelombit'Ko, I. M. Beki and O. F. Syshchenko.
Gig Sanit 3, p 109-110, 1975.

Descriptors: Public health, *Chemical wastes, dustrial wastes, Water pollution, *Iron, Sulfa *Hydroxides, Hydrogen ion concentration.
Identifiers: *Ferric sulfate, *Ferrous hydrox *Ferric hydroxide.

Insufficiently neutralized wastewaters fron chemical plant slime storage pond caused r water pollution. Dissolved ferric sulfate in wastewaters was converted to ferrous hydro upon entering the river, due to change in pH. V subsequent intense aeration the ferrous hydro was converted to ferric hydroxide, giving the r water a yellow-brown color.--Copyright 1 Biological Abstracts, Inc.
W77-01027

A METHOD FOR DETERMINING THE DISP SIVE CAPACITY OF PREPARATIONS US FOR REMOVING OILS FROM WATER S FACE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut O anologii.
N. M. Antonova, O. S. Mochalova, I. A. Nemirovskaya, and M. P. Nesterova.
Okeanologiya 15(2), p 333-337, 1975.

Descriptors: *Emulsification, *Emulsifi *Dispersion, *Oil pollution, Oil was Methodology, Water pollution, Separa techniques.

A method is proposed for the evaluation of dispersive (emulsifying) action of chem products used for removing pollutant oil from water surface. The accelerated method of dest ing the arising emulsions in centrifugal field bles determination of emulsifying and definitio the influence of infinite dilution by water upon bility of the resultant emulsions of oil in wa The method is simple, rapid and yields compar data for different dispersion agents and oi Copyright 1976, Biological Abstracts, Inc.
W77-01028

DISTRIBUTION AND SIGNIFICANCE FECAL INDICATOR ORGANISMS IN T UPPER CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. Microbiology.
For primary bibliographic entry see Field 5C.
W77-01061

5C. Effects Of Pollution

SUBSTANTIATION OF THE MAXIMUM P MISSIBLE CONCENTRATION OF NIOBIUM WATER BODIES, (IN RUSSIAN),
Institut Gigieny Truda i Profzabolovsk (USSR)
L. A. Sazhine, and L. N. El'Nichnykh.
Gig Sanit 6, p 8-10, 1975.

Descriptors: Potable water, *Water quality s dards, Metals, Enzymes, Water pollution effe Public health, Toxicity, Lethal limit.
Identifiers: *Niobium, Maximum permissible centration(Pollutants).

The threshold concentration of niobium as rel to its effect on the general sanitary regimen of water body and its use for drinking water use level of 0.1 mg/l (judging by biological 02 dem and development of saprophytic microorganis The threshold dose of niobium that cau disturbance of certain enzymatic processes in bino rats amounted to 0.005 mg/kg and the inef tive dose was 0.005 mg/kg. The maximum

issible concentration of niobium in water bodies ould be set at a level of a level of 0.01 mg/l ccording to the toxicological index of nox- usness).--Copyright 1976, Biological Abstracts, c.
77-00529

N INVESTIGATION INTO THE EFFECT AND AUSE OF EUTROPHICATION IN GEOR- ETOWN LAKE, MONTANA,
ontana State Univ., Bozeman. Water Resources esearch Center.
Knight, P. Garrison, and J. Wright.
vailable from the National Technical Informa- on Service, Springfield, VA 22161 as PB-259 271, ice codes: A05 in paper copy A01 in microfiche. esearch Report No. 77, (1976). 97 p, 26 fig, 12 b, 57 ref. OWRT A-067-MONT(1).

escriptors: *Eutrophication, *Water quality, iological studies, Phytoplankton, Macrophytes, Montana, Lakes, Water pollution effects, ycling nutrients, Land use, Planning.
entifiers: Georgetown Lake(Mont), Nutrient ycle, Land-use planning.

eorgetown Lake, located 15 miles west of naconda Mining Company, is the most heavily- ed lake in Montana for its size. Because of the ncern for the status of the lake and the potential r development of the watershed, the county mmissioners and conservation districts from eer Lodge and Granite Counties agreed that a udy is needed to be conducted for an overall nd-use plan for the Georgetown Lake watershed. esults include: The phytoplankton appeared to lapt to the low light levels under the ice cover. ankton respiration rates were greater than the ankton gross photo-synthetic rates which in- cates that there is rapid decomposition of dead ytoplankton and additional autochthonous in- uts, i.e. macrophytes. Annual average daily gross oto-synthesis was 0.5 g.C.m-2.day. Plankton oduction during the winter was light limited. osphorus was apparently more limiting than N uring the summer even though both nutrients ere reduced to very low levels. Oxygen depletion nder the ice was due to both sediment and plank- n respiration rates. Additional oxygen input nder the ice was required to compensate for the spiration rates. Macrophytic production and to a mited degree, ice-melt are responsible for the ox- gen input during ice cover. The lake was not in a eady state since annual photosynthetic rates ere greater than annual respiration rates. This in- cates organic matter is accumulating in the sedi- ents. Macrophytic production is of major im- rtance in regulating the lake metabolism.
77-00536

HE DELINEATION AND GROWTH OF A LUDGE FIELD,
stitute of Oceanographic and Fisheries esearch, Athens (Greece).
. B. Griggs, and T. S. Hopkins.
Vater Research, Vol 10, No 6, p 501-506, 1976. 7 g, 10 ref.

escriptors: *Water pollution effects, *Domestic astes, *Sewage disposal, *Gulfs, *Sediments, olor, Odor, Organic compounds, Carbon, ydrogen sulfide, Methane, Sea water, Oxygena- on, Circulation, Aquatic life, Toxicity, coustics, Analytical techniques, Municipal astes.
dentifiers: Saronikos Gulf, Athens, Greece.

he effect of discharging untreated domestic ewage from the city of Athens, Greece, on an ea of restricted circulation in the upper aronikos Gulf was investigated by delineating the olor, odor, organic carbon, and acoustic reflec- on properties of bottom sediments. The scharge of untreated sewage via outfall has led the deposition and growth of a large sludge eld, with approximately 9 sq km of the sea floor being covered by black anoxic muds which give off hydrogen sulfide and are essentially devoid of benthic life. The organic carbon content of the muds is over 6% in some areas near the outfall in comparison with normal regional values of less than 0.5%. Seismic reflection characteristics which are believed to coincide with the production of methane gas distinguish a core area around the outfall. The circulation and oxygenation in the upper Saronikos Gulf are not adequate to disperse the waste water from the Athens area, with the result being that the benthic environment is rapidly being destroyed. (Kreager-FIRL)
W77-00603

THE EFFECT OF DIGESTED SLUDGE ON SOIL BIOLOGICAL ACTIVITY,
Wyzsza Szkola Rolnicza, Wroclaw (Poland).
For primary bibliographic entry see Field 5D.
W77-00612

EFFECTS OF SLAG ON AQUATIC LIFE,
Kinki Univ., Osaka (Japan). Dept. of Fisheries.
Y. Iitaka, R. Tsunda, T. Morinaga, and H. Kumai.
Mer (Tokyo). 11(4), p 205-210, 1973.

Descriptors: Water pollution effects, Aquatic life fish, *Zooplankton, *Growth rates, Rotifers, *Fish eggs.
Identifiers: *Slag.

The adhesion of aquatic life to iron slag dropped in the sea was observed. Fish were bred in containers either with or without slags. The growth rate of zooplankton, rotifer and the survival rate of fish eggs and larvae were studied. There were minor effects on the aquatic life. The aquatic organisms adhered to or gathered around slags immediately after they were dropped in the sea. The growth rate of fish in containers containing slags was better than that in containers without slag.--Copyright 1975, Biological Abstracts, Inc.
W77-00625

HEAVY METALS IN SOME NEW ZEALAND COMMERCIAL SEA FISHES,
Massey Univ., Palmerston North (New Zealand). Dept. of Chemistry, Biochemistry and Biophysics.
R. R. Brooks, and D. Rumsey.
N Z J Mar Freshwater Res. 8(1), p 155-166, 1974.

Descriptors: Heavy metals, Cadmium, Iron, Lead, Manganese, Nickel, Marine fish, Commercial fish, Copper, Chromium, Trace elements, Zinc, Toxicity.
Identifiers: Arripis-Trutta, Caranx-Lutescens, Cheilodactylus-Macropterus, Chrysophrys-Auratus, King-fish, Latridopsis-Ciliaris, *New Zealand, Polyprion-Oxygeneios, Seriola-Grandis, Snapper, Trigla-Kumu.

To establish a base line against which future pollution may be measured, 8 common commercial species of New Zealand sea fish were analyzed for Cd, Cr, Cu, Fe, Pb, Mn, Ni and Zn. One sample of edible muscle tissue was analyzed for each of 70 samples of each species. The internal organs of up to 5 specimens of each species were also analyzed. The fish studied were: kahawai, Arripis trutta, trevally, Caranx lutescens, tarakihi, Cheilodactylis macropterus, snapper, Chrysophrys auratus, moki, Latridopsis ciliaris, hapuku, Polyprion oxygeneios, kingfish, Seriola grandis and gurnard, Trigla kumu. Although none of the edible parts of the fish appeared to have trace element levels likely to be a public health problem (Cd 0.002-0.02 ppm, Cr 0.01-0.04 ppm, Cu 0.04-0.95 ppm, Fe 0.9-13.5 ppm, Pb 0.14-0.95 ppm, Mn 0.04-2.00 ppm, Ni 0.01-0.08 ppm, Zn 2.0-36.0 ppm), some of the organs (particularly the liver) had relatively high concentrations of elements such as Cd (up to 54 ppm). Only if some industry were to seek to exploit internal organs of fish for human consumption would such levels become important. There was some evidence for a relationship between trace element concentrations and fish size for Cu in king-fish and snapper, Fe in hapuku, Mn in gurnard, and for Zn in kingfish and tarakihi. Some element pairs such as Cu and Zn, Fe and Mn, appeared to have concentrations which were mutually related. It was assumed that the elemental concentrations reported represent natural levels and are not the result of significant man-made pollution because there are no major industries or large urban centers adjacent to the fishing grounds.--Copyright 1975, Biological Abstracts, Inc.
W77-00660

TOXICITY OF PARAQUAT TO PARACALLIOPE FLUVIATILIS (AMPHIPODA),
Canterbury Univ., Christchurch (New Zealand). Dept. of Zoology.
D. M. Hunt.
Mauri Ora. 2, p 67-72, 1974.

Descriptors: *Toxicity, Mortatity, *Amphipoda, *Paraquat, Herbicides, Water pollution effects, Aquatic weed control.
Identifiers: *Paracalliope-Fluviatilis.

Toxicity of the bipyridilium herbicide paraquat (used to control aquatic weeds) to the amphipod P. flubiatilis was investigated in the laboratory. Amphipods died in concentrations as low as 0.05 ppm. Mortality was greater among smaller amphipods. A delayed toxic effect was exhibited, with 70% of the amphipods accumulating a lethal dose after 10 h in 0.1 ppm paraquat. Paraquat adsorbed to sediment was still available for uptake by amphipods, although mortality rates were lower than those in paraquat solution.--Copyright 1975, Biological Abstracts, Inc.
W77-00666

SEDIMENT CHARACTERISTICS AND THE TROPHIC STATUS OF FOUR OREGON LAKES,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W77-00673

INTERRELATIONSHIPS BETWEEN CERTAIN MICROORGANISMS AND SOME ASPECTS OF SEDIMENT-WATER NUTRIENT EXCHANGE IN TWO BAYOU ESTUARIES, PHASES I AND II,
University of West Florida, Pensacola. Dept. of Biology.
G. A. Moshiri, W. G. Crumpton, D. P. Brown, P. R. Barrington, and N. G. Aumen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 538, Price codes: A03 in paper copy, A01 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 37, July 12, 1976. 45 p, 9 fig, 43 ref, append. OWRT B-024-FLA(2) and B-027-FLA(1). 14-31-0001-5065 and 14-31-0001-6068.

Descriptors: Bayous, Eutrophication, *Phosphates, Nutrients, Oxygen, *Bacteria, Dissolved solids, Glucose, *Dissolved oxygen, Estuaries, Absorption, Productivity, Kinetics, *Sediments, Microorganisms, *Oxidation-reduction potential.
Identifiers: *Oxygen depletion, *Glucose, Heterotrophic productivity, *Nutrient exchange.

Over a two-year period, certain aspects of nutrient exchange and regeneration were studied as related to major physical, chemical, and microbial parameters in two bayou estuaries. Sediment to water phosphate (PO3-4) exchange was affected by dissolved oxygen concentrations in both systems, but Eh effects of oxygen depletion on PO3-4 exchange kinetics differ in the two bayous. Sediment Eh profiles follow a temporal pattern perhaps related to the bacterial activity. Glucose

concentrations and uptake were monitored as related to possible sources and utilizers respectively. (Morgan-Florida)
W77-00674

AN AQUEOUS ENVIRONMENTAL SIMULATION MODEL FOR MID-SOUTH LAKES AND RESERVOIRS,
Arkansas Univ., Fayetteville. Coll. of Engineering.
L. J. Thibodeaux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 539, Price codes: A05 in paper copy, A01 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Publication No. 41, Engineering Experiment Station, Research Report No. 27, June 30, 1976. 82 p, 26 fig, 6 tab, 31 ref, append. OWRT A-026-ARK(3). 14-34-0001-6058.

Descriptors: *Arkansas, Water pollution effects, *Mathematical models, Lakes, Aqueous environment, *Simulation analysis, *Eutrophication, Forecasting, Reservoirs, *Model studies, Computer programs, Fish, Stratification, Aerobic bacteria, Phytoplankton, Zooplankton.
Identifiers: *Beaver Reservoir(Ark).

Quantitative relationships and associated computer program have been developed to simulate some of the major physical, chemical and biological processes occurring within the aqueous phase of lakes and reservoirs. The model was developed, in part, to study the eutrophic development of these water bodies. Emphasis is upon lakes in the Mid-South U.S.A. The physical model reflects the general environment in this region and includes a single stratified period. The chemical subsystem includes nitrogen, phosphorus, oxygen and carbon. The biological subsystem includes phytoplankton, zooplankton, omnivorous fish, carnivorous fish and aerobic bacteria. The model differential equations are solved numerically with the IBM Continuous System Modeling Program (CSMP). The output results (graphical or numerical) of critical eutrophic parameters can be obtained as a function of time (Julian Day), depth and distance down-lake. The model has been adjusted to field data from Beaver Reservoir in Northwest Arkansas. A comparison of the adjusted simulation and the field data is presented along with examples of use of the model for predictive purposes. An appendix contains the program listing, documentation and case studies. (See also W76-11692)
W77-00675

OYSTER SETTING AND EARLY SPAT SURVIVAL AT CRITICAL SALINITY LEVELS ON NATURAL SEED OYSTER BEDS OF DELAWARE BAY,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W77-00676

THE EFFECT OF SEWAGE-TREATMENT-PLANT EFFLUENT ON DIATOM COMMUNITIES IN THE NORTH BRANCH OF THE PORTAGE RIVER, WOOD COUNTRY, OHIO,
Bowling Green State Univ., Ohio. Dept. of Biology.
R. L. Lowe, and J. M. McCullough.
Ohio J Sci. 74(3), p 154-161, 1974.

Descriptors: Water pollution effects, *Diatoms, *Ohio, Rivers, Effluents, *Phosphorus, *Sewage effluents, Biological communities, *Nitrogen.
Identifiers: Achnanthes-affinis-var-affinis, Diatoma-hiemale-var-hiemale, Fragilaria-construens-var-binodis, Gompho-nema -vulum, Gyrosigma-macrum-var-vacrum, Navicula-spp, Nitrogen, Nitzschia-spp, Pinnilaria, brebissonii-var-brebisson, River, Stauroneis-anceps-F-Linearis, *Potage River(Ohio).

The North Branch of Portage River was sampled using artificial substrates to determine the effect of sewage-treatment-plant effluent on the diatom communities. The effluent is a source of N & P for the river. Diatom-community composition is affected by the effluent; Gomphonema parvulum was especially abundant at stations with a high content of effluent. A total of 111 diatom taxa was observed; 24 of these taxa (Achnanthes affinis var. affinis, Diatoma hiemale var. hiemale, Fragilaria construens var. binodis, Gyrosigma macrum var. macrum, Navicula capitata var. luneburgensis, N. heufleri var. leptocephala, N. heufleri var. heufleri, N. muralis var. muralis, N. mutica var. mutica, N. mutica var. undulata, N. peregrina var. peregrina, N. placentula var. placentula, N. rhynococephala var. rhynococephala, N. viridula var. avenacea, Nitzschia acuminata var. acuminata, N. accomodata var. accomodata, N. baccata var. baccata, N. communis var. communis, N. denticula var. denticula, N. frustulum var subsalina, N. palea var. tropica, Pinnularia brebissonii var. brebissonii, Stauroneis anceps f. linearis were previously unreported from Ohio (USA).--Copyright 1975, Biological Abstracts, Inc.
W77-00681

PLANKTONIC CRUSTACEA OF THE RESERVOIR OF CUBILLAS NEAR GRANADA, (IN SPANISH),
Granada Univ. (Spain). Lab. of Ecology; and Granada Univ. (Spain). Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W77-00683

INFLUENCE OF WATER TREATED ARTIFICIALLY WITH HERBICIDES ON HONEY BEE COLONIES,
Agricultural Research Service, Tucson, Ariz.
H. L. Morton, J. O. Moffett, and R. D. Martin
Environ Entomol. 3(5), p 808-812, 1974.

Descriptors: *Herbicides, *Paraquat, Water pollution effects, Insects.
Identifiers: Apis-Mellifera, *Honey bee colonies.

Apis mellifera L. colonies were placed in isolated desert apiaries where their only source of water contained paraquat (concentration of 1000 parts per million active ingredient by weight (ppmw)). Large numbers of bees exposed to paraquat died immediately, and all were dead before the end of the 5th wk. When colonies were similarly exposed to like amounts of 2,4,5-T, larger numbers of bees drowned in the water because of the lower surface tension of the water, and production of brood was reduced below that of check colonies during the period the treated water was used and for 3 mo. thereafter; however, in the subsequent 9 mo., production returned to normal. Concentrations of 2,4,5-T in honey bees from colonies using water containing 2,4,5-T were as high as 148 ppmw, but this level dropped to about 5 ppmw as soon as the bees began using untreated water. Likewise, honey from colonies using water containing 2,4,5-T contained concentrations of 2,4,5-T as high as 50 ppmw; however, the concentration dropped to about 5.0 ppmw within 1 wk after the bees began using untreated water. The last day when any 2,4,5-T was detected in honey bees and honey from treated colonies was 480 days after the experiment began. Wax from colonies using the treated water contained detectable amounts of 2,4,5-T 650 days after the study was initiated.--Copyright 1975, Biological Abstracts, Inc.
W77-00689

INFANT MORTALITY AND WATER HARDNESS IN THE UNITED STATES,
National Inst. of Child Health and Human Development, Bethesda, Md. Epidemiology. Branch.
For primary bibliographic entry see Field 5G.
W77-00698

THE SEDIMENTS OF LAKE GEORG (UGANDA). I: REDOX POTENTIALS, OXYGE CONSUMPTION AND CARBON DIOXIDE OU PUT,
Malaya Univ., Kuala Lumpur (Malaysia). Scho of Biological Sciences.
A. B. Viner.
Archiv fur Hydrobiologie, Vol. 76, No. 2, p. 18 197, 1975. 8 fig., 13 ref.

Descriptors: *Bottom sediments, *Oxidatio reduction potential, *Oxygen demand, *Carb dioxide, *Cycling nutriets, Dynamics, Tropical r gions, Eutrophication, Metabolism, Dissolv solids, Phosphates, Nitrogen, Oxygenation, C ganic matter, Mud, Microorganisms, Africa.
Identifiers: *Lake George(Uganda).

To understand nutrient dynamics in tropical lak bottom sediments of equatorial, eutrophic La George (Uganda) were studied. The gross metab ic activity of sediments was studied to indicate t amount of mineralization possible. Low dissolv nutrient concentrations and high primary bioma producers did not permit nutrient utilization ra of change to be measured. Phosphate and in ganic combined nitrogen critically influenced p mary production measurements. Turbulen through the shallow water column disturbed rich organic sediments. Gross metabolic activity w measured in terms of oxygen consumption, carb dioxide liberation, and oxidation-reduction pote tial changes. Metabolic rates in vertical m profile samples were strongly dependent on o ygen supply, which was largely controlled by t bulent mixing of water into mud and rapid oxyg consumption by large amounts of organic matter the sediments. Turbulent mixing probably co tributed to distribution of bacteria to about 18 c of mud. This volume of mud could potentia supply nutrients to the water column, but the c ganic content permitted such rapid oxygen utili tion that aerobic bacterial metabolism stopp quickly. Succession of various anaerobic micro ganisms was blocked. Reduced aerobic activ preserved organic material in an undecompos state. The significance of nutrient recycling fr sediments was limited compared to prima producer potential demands. (Buchanan-Dav son—Wisconsin)
W77-00712

THE ROLE OF SEDIMENT AS A MODIFYI FACTOR IN PESTICIDE-ALGAE INTERA TIONS,
Rutgers - The State Univ., New Brunswick, N. Dept. of Botany.
M. A. Gillott, G. L. Floyd, and D. V. Ward.
Environmental Entomology, Vol. 4, No. 4, p. 62 624, 1975. 1 tab., 32 ref.

Descriptors: *Sediments, *Pesticides, *Algae, I hibition, Insecticides, DDT, Photosynthes Euglena, Adsorption, *Toxicity, Translocatio Water pollution effects, Pesticide residues.
Identifiers: Carbaryl, Abate.

To determine the influence of pesticide-sedime associations on pesticide-algae interactions, hibitory effects of three pesticides (DDT, Aba and carbaryl) on algal photosynthesis were studi in one compartment (axenic Euglena gracilis c tures) and two compartment (alga plus sedime systems. Carbon-14 incorporation was used to dicate photosynthetic activity. Twenty-four ho exposures to either DDT or carbaryl caused s nificant inhibition of photosynthesis in E. graci at concentrations of 10 ppb or higher. Abate w only marginally inhibitory at concentrations up 100 ppb. Sediment dampened the pesticide effe Differences between toxicities in 1 and 2 compa ment systems were statistically significant for three insecticides. Addition of sediment caus only slight increases in photosynthesis relative non-sediment samples at the lowest pestici levels; but at greater concentrations the sedime effect was greater. The size of sediment, the

ganic matter content, or presence of detergents or other surfactants could alter the sediment effects. The significant reduction of photosynthesis of E. gracilis by carbaryl or DDT in the presence of sediments, would suggest that in nature sediments would dampen insecticide toxicities, especially in shallow bodies of water with large surface to volume ratios. (Buchanan-Davidson--Wisconsin)
W77-00713

DETRITUS FORMATION FROM EELGRASS (ZOSTERA MARINA L.): THE RELATIVE EFFECTS OF FRAGMENTATION, LEACHING, AND DECAY,
Dalhousie Univ., Halifax (Nova Scotia).
P. G. Harrison, and K. H. Mann.
Limnology and Oceanography, Vol. 20, No. 6, p. 924-934, 1975. 7 fig., 8 tab., 29 ref.

Descriptors: *Marine plants, *Detritus, *Degradation(Decomposition), *Leaching, Leaves, Biodegradation, Laboratory tests, Particle size, Organic matter, Sea water, Nitrogen, Littoral, Carbon, Drying, Primary productivity, *Canada, *Decomposing organic matter.
Identifiers: *Eelgrass, St. Margaret's Bay(Nova Scotia).

Decomposition reduces leaf particulate detritus to subparticulate forms by fragmentation, autolysis, leaching, and microbial decay. Eelgrass detritus consists of nonliving leaf debris and associated, living microorganisms. In laboratory experiments, dead eelgrass leaves lost 35% of their original dry weight in 100 days at 20C. Whole leaves lost 0.5% of their organic content/day, while particles less than 1 mm lost 1%/day. Sterilization of leaves by dry heat or potassium cyanide indicated that leaching accounted for 82% of the organic matter lost from predried material and 65% of that lost from undried material. Bacteria increased detrital nitrogen but degraded leaf material slowly. When protozoa grazed on bacteria, they kept the bacteria in an active metabolic state and increased decay rates. Incubated detritus carbon:nitrogen ratios decreased from 20:1 to 11:1, indicating an increase in potential food value. This slow decomposition rate could permit the eelgrass detritus system to continue functioning during short-term fluctuations in eelgrass primary production by ensuring the presence of slowly decomposing material. A model illustrates the eelgrass detritus system. Formation of detritus from eelgrass leaves is important in many coastal marine environments. (Buchanan-Davidson--Wisconsin)
W77-00715

SOME THEORETICAL CONSIDERATIONS OF THERMAL DISCHARGE IN SHALLOW LAKES,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
H. L. Golterman.
H20 (The Netherlands), No. 1, p 19-26, January 1976. 16 fig, 19 ref.

Descriptors: *Water pollution effects, *Thermal pollution, *Shallow water, *Biological communities, *Lakes, Photosynthesis, Respiration, Inhibition, Succession, Ecosystems, *Water temperature, Cycling nutrients, Competition, Zooplankton, Food chains, Theoretical analysis, Growth rates, Biomass, Dominant organisms, Eutrophication, Europe.
Identifiers: *Netherlands.

Effects of artificially elevated water temperature by thermal discharge on zooplankton and phytoplankton are described. Energy in aquatic ecosystems enters food chains via phytoplankton and is then dispersed via zooplankton or bacteria. Temperature increases affect net phytoplankton growth positively or negatively, depending on species. At high temperatures, mineralization occurs more rapidly and causes faster growth rates, but not necessarily larger biomass. Temperature strongly influences the selection of dominant species. Both temperature and eutrophication act synergistically to stimulate production of blue-green algal blooms. High temperatures increase the number of zooplankton generations per year without increasing food production. The deleterious effect on overwintering fauna may leave openings in the ecosystem and disturb the predator-prey processes. Tolerance of ecosystems to temperature changes is smaller in winter than in summer. (Buchanan-Davidson--Wisconsin).
W77-00716

SEASONAL FLUCTUATIONS OF DIELDRIN RESIDUES IN THE TISSUES OF THE MARSH CLAM, RANGIA CUNEATA, FROM A TEXAS ESTUARY,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 5B.
W77-00717

A SENSITIVE ALGAL ASSAY: AN IMPROVED METHOD FOR ANALYSIS OF FRESHWATERS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5A.
W77-00719

PHYTOPLANKTON SUCCESSION IN A MATURING NORTHWEST TEXAS RESERVOIR (LAKE MEREDITH),
West Texas State Univ., Canyon. Dept. of Biology.
W. Z. Cooper, and C. E. Newton.
Texas Journal of Science, Vol. 26, No. 3-4, p. 449-458, 1975. 5 fig, 3 tab, 19 ref.

Descriptors: *Biological communities, *Succession, *Phytoplankton, *Reservoirs, *Texas, Dissolved oxygen, Temperature, Cycles, Chlorophyta, Nitrogen, Diatoms, Phosphorus, Cyanophyta, Euglenophyta, Pyrrophyta.
Identifiers: *Lake Meredith(Texas), Ankistrodesmus falcatus, *Cyclotella meneghiniana, Coelastrum microporum, Oocystic borgei.

Lake Meredith, a young, relatively deep impoundment in Texas, was studied from November 1966 to April 1968. Nitrate peaks were observed periodically. Phosphate levels were high at first, but then did not exceed 0.2 mg/1. A temporal succession of phytoplankton was observed which apparently was due to an organism-produced phosphorus depletion. After depletion, phosphorus remained at an almost constant concentration which was more limiting for the green alga, Ankistrodesmus falcatus, than was nitrogen for the diatom, Cyclotella meneghiniana. Cyclotella blooms are controlled by the nitrogen level, thus Cyclotella began to decrease earlier and depleted nitrogen and phosphorus supplies before there was enough phosphorus for Ankistrodesmus to compete. With Ankistrodesmus no longer a dominant part of the community, two colonial algae, Coelastrum microporum and Oocystis borgei filled the niche in community structure. During this period the structure of the blooms began to change: green algal blooms before and after the Cyclotella blooms became smaller and blended with diatom to form a symmetrically cumulative bloom. The identified species are listed, grouped in the order of abundance. (Buchanan-Davidson--Wisconsin)
W77-00720

EFFECTS OF ENVIRONMENTAL FACTORS ON PHOTOSYNTHESIS PATTERNS IN PHAEODACTYLUM TRICORNUTUM (BACILLARIPHYCEAE). II. EFFECT OF OXYGEN,
University Coll., London (England). Dept. of Botany and Microbiology.
J. Beardall, and I. Morris.
Journal of Psychology Vol. 11, No. 4, p. 430-434, 1975. 5 fig., 3 tab., 12 ref.

Descriptors: *Environmental effects, *Photosynthesis, *Diatoms, *Oxygen, Light intensity, Marine algae, Inhibition, Bicarbonates, Hydrogen ion concentration, Respiration, Plant physiology.
Identifiers: *Phaeodactylum tricornutum.

The rate of light-saturated photosynthesis of the marine diatom Phaeodactylum tricornutum was inhibited by oxygen only if the oxygen concentrations approached 100%. At atmospheric oxygen concentrations (21%), there was little effect on photosynthesis. In this respect, Phaeodactylum more closely resembled C-4 plants which have low rates of photorespiration. The test results showed increased oxygen inhibition at reduced bicarbonate concentrations. The Phaeodactylum biochemical mechanism of photorespiration appeared similar to that of other photosynthetic systems. The ribulose-1,5-diphosphate carboxylase activity in cell-free extracts was also inhibited by oxygen. Oxygen inhibition and ribulose-1,5-diphosphate-dependent oxygen uptake were optimal at pH 9.2. Ribulose-1,5-diphosphate carboxylase to oxygenase ratios decreased with increasing pH and were higher in cells grown under lower light intensities. Carboxylase levels were less affected by light intensity for growth than oxygenase levels. The short-term incorporation of sodium bicarbonate-carbon-14 by cells grown at high light intensities showed increased labeling of glycolate and glycine plus serine under oxygen compared to nitrogen. Radioactivity decreased concomitantly in phosphoglyceric acid and sugar phosphates in the presence of oxygen. Oxygen effects on the short-term pattern of photosynthesis were less marked when the alga had been previously grown at low light intensities. (Buchanan-Davidson--Wisconsin)
W77-00721

WATER POLLUTION INVESTIGATION: MAUMEE RIVER AND TOLEDO AREA,
Enviro Central, Inc., Rockville, Md.
J. Horowitz, J. R. Adams, and L. A. Bazel.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 287, $7.50 in paper copy, $3.00 in microfiche. Report EPA-905/9-74-018, January 1975. 185 p. 24 fig., 19 tab., 2 append. EPA 68-01-1567.

Descriptors: *Water pollution, *Ohio, *Rivers, *Estuaries, *Water pollution control, Dissolved oxygen, Hydrologic aspects, Runoff, Treatment facilities, Coliforms, Lake Erie, Water levels, Agricultural runoff, Sewage treatment, Sediment load, Monitoring, Bottom sediments, Effluents, Sampling, Water quality standards.
Identifiers: *Maumee River(Ohio), *Toledo(Ohio).

The combination of hydraulic factors, the historical changes in land use, the runoff sediment load, agricultural runoff, malfunctioning sewers and sewage treatment plant operations, thermal pollution, and Lake Erie water level fluctuations contribute to the gross pollution of the Maumee River estuary in the vicinity of Toledo, Ohio. Among the recommendations suggested to improve the estuary's water quality are that research be instituted of the hydraulics and sediment dynamics of the estuary, as a basis of wasteload quality allocations. Sampling methods must consider the major features of estuarine behavior--stratification, flow reversals, and irregular times of passage. Sample preservation and analysis should be drastically improved and the monitoring programs coordinated. Water quality standards for the lower Maumee and its tributaries must be clarified and more precisely defined; especially the 'ammonia' standard should be restated to delineate ammonium and ammonia. Sewers and sewer regulators should be repaired immediately to eliminate the floating filth and bubbling sludge beds in the river. The thermal outfall should be carefully controlled when the river's DO is low; and that the DO standard of 5 mg/l in the vicinity of the outfall be reconsidered. The water quality standards should be revised to reflect the

diversity of the various watercourses in the area and of their varying potential for improvement. (Auen-Wisconsin)
W77-00723

WATER POLLUTION INVESTIGATION: ERIE, PENNSYLVANIA AREA,
Betz Environmental Engineers, Inc., Plymouth Meeting, Pa.
F. X. Browne.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 628, $7.50 in paper copy, $3.00 in microfiche. Report EPA-905/9-74-014, March 1975. 206 p. 18 fig., 13 tab., 29 ref., 3 append. EPA 68-01-1578.

Descriptors: *Water pollution sources, *Water pollution control, *Pennsylvania, *Lake Erie, Thermal pollution, Tributaries, Industrial wastes, Sewage effluents, Treatment facilities, Water pollution effects, Sewerage, Water quality, Bottom sediments, Plankton, Oil pollution, Heavy metals, Storm drains, Monitoring, Physical properties, Bacteria, Chemical properties, Biological properties.
Identifiers: *Erie(Pa), *Presque Isle Bay(Pa), Garrison Run(Pa), Mill Creek(Pa), Penn Central RR Yards.

Water quality in Presque Isle Bay and Lake Erie near Erie, Pennsylvania, is relatively good, except for high levels of total and fecal coliform bacteria. A few localized areas of degraded water quality were identified. Hammermill Paper Company waste water discharges are pigmented. Heated condenser discharges from the Pennsylvania Electric Company have recirculated into the bay, causing annual dieoffs of gizzard shad. Cascade Creek, Mill Creek, and Garrison Run are polluted. Mill Creek contributes the highest pollution load, followed by Cascade Creek and Garrison Run, based on water quality determinations and flow estimates. Minimal yard operations are being performed by Penn Central, but some areas are impregnated with oil which is sometimes picked up by stormwater. Water quality at Beach 11 on Presque Isle Bay may be adversely affected by filling the area adjacent to Koppers Company with lake dredge materials. Monitoring of physical, chemical, and biological parameters, and flow of the three tributaries should be continued in order to define the magnitude, causes, and effects of water quality problems. Temporal and spatial trends should be identified. Illegal sanitary and industrial connections should be eliminated. The Hammermill Paper Company should reduce their wastewater discharges. Penn Central should initiate an oil spill prevention and clean-up program. (Buchanan-Davidson--Wisconsin)
W77-00724

THE INFLUENCE OF LAND USE ON STREAM NUTRIENT LEVELS,
Corvallis Environmental Research Lab., Oreg. Eutrophication Survey Branch.
J. M. Omernik.
Report EPA 600/3-76-014, January 1976. 114 p. 29 fig., 8 tab., 31 ref., 1 append.

Descriptors: *Watersheds(Basins), *Land use, *Runoff, *Nutrients, *Mathematical models, Urban runoff, Agricultural runoff, Forest watersheds, Phosphorus, Nitrogen, Streams, Streamflow, Flow rates, Eutrophication, Surveys, Forecasting, Hydrogen ion concentration, Equations, Regression analysis.
Identifiers: Non-point nutrient sources, National Eutrophication Survey.

Drainage area characteristics and stream nutrient runoff data for 473 non-point source-type drainage areas in eastern United States were analyzed based on the National Eutrophication Survey data. Higher nutrient concentrations were found in streams draining agricultural rather than forested watersheds. Nutrient concentrations were generally proportional to percent of agricultural land. Mean total phosphorus concentrations were nearly ten times greater and mean total nitrogen concentrations five times greater in streams draining agricultural rather than forested areas. Inorganic nitrogen increased from about 27% in streams draining forested areas to over 75% in streams draining agricultural watersheds. Orthophosphorus was always about 40% of total phosphorus contents. Differences in nutrient loads were not as pronounced as differences in nutrient concentrations in streams in different land use areas, mainly due to differences in areal streamflow, mean annual precipitation patterns, and mean slope of study areas. The most accurate method of predicting export values or stream loads was to use models for stream nutrient concentrations and multiply by flow. Regression analyses of the combined percentages of agricultural and urban land uses against both the total and inorganic forms of phosphorus and nitrogen were performed. Equations for these analyses, together with maps illustrating the equations' residuals, offer a limited predictive capability and some accountability for regional characteristics. (Buchanan-Davidson--Wisconsin)
W77-00725

PLANT PRODUCTION IN EXPERIMENTAL STREAMS, A COOPERATIVE RESEARCH PROJECT WITH WEYERHAEUSER COMPANY,
Oregon State Univ., Corvallis. Dept. of Botany and Plant Pathology.
D. E. Busch, and C. D. McIntire.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 606, Price codes: A02 in paper copy, A01 in microfiche. Completion Report WRRI-45, September 1976. 17 p, 6 fig, 7 ref. OWRT A-035-ORE(1).

Descriptors: *Plant growth, *Energy budget, *Nutrients, *Primary productivity, Herbivores, Algae, Industrial wastes, Ecosystems, Trophic level, Washington, Light, Biomass, Eutrophication, Nitrogen, Chlorophyll, Periphyton, Invertebrates, Standing crops, Algal control.
Identifiers: Bioenergetics, Carnivores.

The general objective is to determine the effects of nutrient enrichment and other environmental changes on rates of primary production and on the structure of algal communities in experimental streams. Nutrient enrichment-primarily nitrogen will simulate introductions related to forest management policies practiced by Weyerhaeuser Company, Longview, Washington, namely forest fertilization and nutrient introductions resulting from logging activities. The project was designed as a sequence of two experiments, designated the winter and summer experiments. The winter experiment involved reducing light intensity, while the summer experiment was concerned with nutrient (nitrate) enrichment at different light intensities. The recovery of the stream system after the catastrophic reduction of biomass in the riffles was characterized by a rapid accumulation of algae and invertebrates. Measures are presented of total biomass (ash free dry weight), algal standing crop (chlorophyll a concentration), and animal standing crop (dry weight estimated from observed body size). These patterns of accumulation do not indicate a steady, continual increase in living material with distinct differences between streams receiving different intensities of light. Total biomass exhibited an increase, decrease, and subsequent increase after the perturbation for both the shaded and unshaded streams. This pattern was also observed in the estimates of algal density in the riffles. However, the unshaded riffles showed a faster accumulation of algae than the shaded riffles during the first 70 days. Standing crop of invertebrates differed from this pattern. Invertebrate biomass increased and then gradually decreased in both streams during the experiment. The patterns of algal, invertebrate, and total biomass represented biological responses to an increase of resources. The removal of biomass i creased a critical resource (space) for periphy algae under constant physicochemial conditio The subsequent accumulation of algae increas the food resource for the invertebrates. Grazi reduced algal density, and reduced algal densi supported a lower invertebrate standing crop. E mates of herbivore and carnivore biomass dicated herbivore response to algal increase f lowed by carnivore response to herbivore crease.
W77-00735

EVALUATING IMPACT OF FOREST SI PREPARATION ON SOIL AND WATER QUA TY IN THE U.S. GULF COASTAL PLAIN,
Forest Service (USDA), Oxford, Miss. Southe Forest Experiment Station.
For primary bibliographic entry see Field 5B.
W77-00740

CHEMICAL CHARACTERISTICS AND ACU TOXICITY OF FOAM ON TWO AERAT LAGOONS,
International Pacific Salmon Fisheries Comm sion, Cultus Lake (British Columbia). Swelt Creek Salmon Research Lab.
J. A. Servizi, R. W. Gordon, I. H. Rogers, and H W. Mahood.
Journal of the Fisheries Research Board Canada, Vol. 33, No. 6, p 1284-1290, June, 197 fig, 1 tab, 21 ref.

Descriptors: *Pulp and paper industry, *Lagoo *Foaming, *Chemical wastes, *Toxicity, Sock salmon, Fish, Biological treatment, Indust wastes, Acids, Resins, Surfactants, Chemical p perties, Physical properties, Waste water tr ment.
Identifiers: Terpenes, Diterpenes, Resin acids.

Foam collected from two aerated lagoons treat kraft pulp effluents was highly toxic to juve sockeye salmon (Oncorhynchus nerka). Bioass of the fish demonstrated that the toxicity of foam was contained in the methanol-soluble fr tion. Chemical fractionation of one foam revea large amounts of toxic resin acids and neu diterpenes. In the other foam, toxicity was rela to a nonionic surfactant pitch dispersant unidentified material. The foam containing to resin acids and neutral diterpenes was 1000 ti more toxic to salmon than bleached kraft mill fluent. Neither foam was readily detoxified biological treatment in the laboratory. The che cal and physical characteristics of each foam tabulated in detail. (Kreager-FIRL)
W77-00752

EFFECT OF AN ARTIFICIALLY INCREAS SAND BEDLOAD ON STREAM MORPHOLO AND ITS IMPLICATIONS ON FISH HABITA
North Central Forest Experiment Station, Rhi lander, Wis. Inst. of Forest Genetics.
For primary bibliographic entry see Field 2J.
W77-00814

THE MACROPHYTE VEGETATION OF FI LAKES IN VEFSN, NORDLAND COUN NORTH NORWAY, (IN NORWEGIAN),
L. Malme.
Blyttia 32(4), p 239-250, 1974.

Descriptors: *Vegetation, Lakes, *Oligotrop Humus, Mesotrophy.
Identifiers: Carex-Spp, Comarum-palus Equisetum-fluviatile, Galium-uliginosum, Junc filiformis, Lobelia, Myriophyllum-alterniflor Potamogeton-Spp, Ranunculus-reptans, Scirp palustris, Sparganium-angustifolium, Subula aquatica, Vefsn, *Macrophyte vegetat *Nordland County(Norway).

om chemical parameters, the lakes are scribed as oligotrophic, moderately acid to utral, poor in electrolytes and Ca and mesohuous to oligohumous. The lakes are strongly exsed to winds, and the bottom substratum in the allow zones mainly consist of mineral materials. ne lakes are classified as Lobelia lakes. The getation is poor in species and the biomass is w. Common taxa include Carex spp., Comarum lustre, Equisetum fluviatile, Galium uliginosum, ncus filiformis, Myriophyllym alterniflorum, tamogeton spp., Ranuculus reptans, Scirpus pastris, Sparganium angustifolium and Subularia uatica.–Copyright 1976, Biological Abstracts, c.
77-00823

FFECTS OF SEDIMENTATION ON COASTAL ONE ORGANISMS,
ew York Univ. Medical Center, N. Y. Lab. for vironmental Studies.
M. O'Connor, and J. A. Sherk.
: Proceedings of the Third Federal Inter-Agency dimentation Conference, 1976; Denver, olorado, March 22-25, 1976. Water Resources ouncil, Washington, D. C., Sedimentation Comttee, p 6-1 - 6-16, 1976. 45 ref.

escriptors: *Sedimentation, *Biology, *Coasts, fineral industry, Water pollution, Effects, ological communities, Marine biology, Fish, enthic fauna, Zooplankton, Sediments, redging, Waste disposal, Turbidity, Estuaries, spended solids, Shores, Phytoplankton.
entifiers: *Sedimentation effects, Coastal zone.

me direct and indirect effects of sedimentation coastal zone organisms were identified and scussed with respect to future increases in exoitation of coastal zone mineral resources (sand d gravel mining, oil and gas extraction), conuction, dumping (sewage sludge, dredged aterial, demolition debris), and dredging. It was ncluded that the potential biological effects of rticulate organic and inorganic material which s been suspended, resuspended, and deposited the coastal zone will depend at least upon (1) ncentration, (2) composition (mineral types, rticle sizes and shapes), (3) sorbed minerals, xins, or other associated substances, and (4) lerances of the organisms. Tolerance limits ensitivities) of organisms to sedimentation can ffer with respect to trophic level, life stage, feedg mechanisms, habitat preference (mud-water terface, shoal water, open water) and duration of posure. At coastal zone sites selcted for sedientation changes, an appropriate basis for preoject decision making could be provided by entification of the most sensitive biological comnents (important species and life stages) and an equate knowledge of local conditions. (See also 77-00775) (Sims-ISWS)
77-00838

HEMICAL AND BIOLOGICAL MOBILIZAON OF HEAVY METALS FROM ESTUARINE DIMENTS,
rps of Engineers, San Francisco, Calif. South cific Div.
r primary bibliographic entry see Field 5C.
77-00839

HEMICAL AND BIOLOGICAL MOBILIZAON OF HEAVY METALS FROM ESTUARINE DIMENTS,
rps of Engineers, San Francisco, Calif. South cific Div.
H. Wakeman.
Proceedings of the Third Federal Inter-Agency dimentation Conference, 1976; Denver, olorado, March 22-25, 1976. Water Resources ouncil, Washington, D. C., Sedimentation Comttee, p 6-17 - 6-27, 1976. 11 ref.

Descriptors: *Sediments, *Heavy metals, Biology, *Estuaries, Dredging, Chemical reactions, *Biological communities, Suspended solids, Cadmium, Lead, Zinc, Copper, Chemistry, Water pollution, Waste disposal, Pollution.
Identifiers: *Biological reactions.

The recent emphasis on estuarine pollution has culminated in a series of Federally funded research programs to identify the mechanisms involved in the movement of heavy metals from the sediment reservoir into the biosphere. The U. S. Army Corps of Engineers, San Francisco District, as part of its Dredge Disposal Study, is conducting experiments both in the laboratory and in the field to evaluate the possible influence of dredging operations on mobilization of heavy metals, and their ultimate uptake and accumulation by estuarine biota. Investigations have shown that cadmium, lead, zinc, and copper can be emitted from resuspended San Francisco Bay sediments under oxygen rich conditions. Biological investigations have shown that dissolved heavy metals ions can be accumulated during low salinity periods and desorbed as the salinity increases. Field studies have shown that estuarine organisms will accumulate heavy metals during periods of high urban runoff. Heavy metals may be taken up and accumulated by organisms following dredging activities via chemical reactions in the water column causing increased ambient concentrations or by ingesting and breaking down organic matter containing metals. (See also W77-00775) (Sims-ISWS)
W77-00839

BIOLOGICAL EFFECTS OF HEAVY METALS ON JUVENILE BAY SCALLOPS, ARGOPECTEN IRRADIANS, IN SHORT-TERM EXPOSURES,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center.
D. A. Nelson, A. Calabrese, B. A. Nelson, J. R. MacInnes, and D. R. Wenzloff.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 3, 1976, p 275-282, 3 tab, 23 ref.

Descriptors: Environmental effects, *Heavy metals, *Mollusks, *Cadmium, *Silver, *Mercury, *Arsenic, *Mortality, *Respiration, Toxcity, Water pollution effects.
Identifiers: Argpecten irradians.

The purposes were to determine the acute effect of arsenic, cadmium, mercury, and silver on survival of juvenile bay scallops after 96 hours of exposure, to investigate tissue uptake of these metals, and to determine changes in oxygen consumption rates in scallops exposed to the estimated LC5 and LC25 values of silver and cadmium as determined from the acute toxicity studies. 95% mortality was seen with silver concentrations of 0.086 ppm, mercury at 0.150 ppm, cadmium at 2.33 ppm, and arsenic at 5.41 ppm. 50% mortality values were 0.033 ppm for silver, 0.089 ppm for mercury, 1.48 ppm for cadmium, and 3.49 ppm for arsenic. Results indicated that scallops exposed to the LC5 and LC25 levels of cadmium exhibited significantly higher oxygen consumption rates than the controls. Scallops exposed to silver at the LC25 level respired at a higher rate but those at the LC5 level respired at a slightly lower rate. Results indicated that scallops can rapidly accumulate high levels of metals in their body tissues. (Chilton-ORNL)
W77-00872

ACCUMULATION AND DISTRIBUTION OF SELENIUM IN MUSSEL AND SHRIMP TISSUES,
International Lab. of Marine Radioactivity Monte Carlo (Monaco). Oceanographic Museum.
S. W. Fowler, and G. Benayoun.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 3, 1976, p 339-346, 4 fig, 1 tab, 16 ref.

Descriptors: Environmental effects, *Selenium, *Mussels, *Shrimp, *Bioassay, Heavy metals, Toxicity, Water pollution effects, Absorption.
Identifiers: Tissue accumulation, Exoskeleton.

One group of mussels and shrimps was maintained in sea water containing 0.8 microCi/l high specific activity Se 75. Another group, maintained in flowing sea water, was fed ad libitum mussels that had previously accumulated Se 75 from sea water. The third group was analyzed to assess tissue distribution of stable selenium in animals considered to be at equilibrium with this element in their environment. The highest concentrations in shrimp tissues of selenium accumulated from water were found in the exoskeleton. Molts contained from 60 to 90% of the total Se 75 body burden. When uptake occurred via the food chain, the highest activity was found in the visceral tissues but the high level of Se 75 associated with the exoskeleton attests to the fact that ingested selenium is readily translocated from internal to external tissues. The relative order of stable selenium in shrimp tissues showed that viscera displayed the highest, eyes and exoskeleton intermediate, and muscle the lowest concentrations. In mussels, the mantle had the highest stable selenium concentration of any tissue analyzed and the lowest degree of uptake in the tracer study. (Chilton-ORNL)
W77-00873

UPTAKE AND RELEASE OF PHOSPHORUS BY PHYTOPLANKTON IN THE CHESAPEAKE BAY ESTUARY, USA,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. L. Taft, W. R. Taylor, and J. J. McCarthy.
Marine Biology, Vol. 33, 1975, p 21-32, 3 fig, 6 tab, 46 ref. AT(11-1)-3279.

Descriptors: *Metabolism, *Phytoplankton, Plant physiology, *Phosphorus, *Phosphates, Membranes, On-site investigations, *Absorption, *Chesapeake Bay.
Identifiers: *Excretion.

Uptake and release rates for inorganic phosphate, dissolved organic phosphate and polyphosphate by phytoplankton were estimated during 5 cruises covering a 9 month period of time. The time for phophorus turnover in all pools ranged from several minutes to 100 h. Each soluble pool appeared to contain fractions which were metabolically useful to phytoplankton. At low soluble reactive phosphorus concentrations, the uptake rate of trace P 32 orthophosphate was initially rapid, but declined after 15 to 60 min. incubation. The common shape of the P 32 orthophosphate uptake curves suggests that the initial rapid rate of uptake and subsequent reduced rate represent different phenomena. It was suggested that either the entire curve represents net uptake which slows with experiment duration as the level of available orthophosphate approaches the uptake limiting concentrations or that the initial uptake represents exchange across the cell membrane and only the subsequent reduced rate is net uptake. (Chilton-ORNL)
W77-00874

THE EFFECTS OF TEMPERATURE AND HYDROSTATIC PRESSURE ON ENZYMES OF AN ABYSSAL FISH, ANTIMORA ROSTRATA: LIVER NADP-LINKED ISOCITRATE DEHYDROGENASE,
Ottawa Univ. (Ontario). Dept. of Biology.
T. W. Moon, and K. B. Storey.
Compilations in Biochemistry and Physiology, Vol. 52B, p 51-57, 1975 7 fig, 2 tab, 24 ref.

Descriptors: Environmental effects, *Temperature, *Hydrostatic pressure, Fish, Benthos, *Enzymes, Water pollution effects.
Identifiers: Enzyme activity, *Antimora rostrata.

NADP-linked isocitrate dehydrogenase was isolated from the liver of the benthic fish Antimora rostrata. Investigation showed that, at high isocitrate concentrations, enzyme activities were moderately affected by pressure increases of up to 12000psi. The enzyme activities were very temperature sensitive below 12C. The enzyme activity was inhibited at high concentrations of the reduced pyridine nucleotides, NADH and NADPH. Physiological pressure and temperature conditions enhanced the activity of NADH and NADPH at low concentrations. Guanosine-triphosphate and alpha ketoglutarate also acted as modifiers of IDH activities. It was concluded that these modifiers were responsible for reducing the pressure and temperature sensitivities of this enzyme and that they implicate the importance of this enzyme in cellular metabolism. (Chilton-ORNL)
W77-00875

THERMAL STRESS FOR HEXADECANE DECOMPOSITION IN SEAWATER OF A NATURAL ENVIRONMENT,
Tokyo Univ. (Japan). Ocean Research Inst.
H. Seki.
La mer, Vol. 13, No. 2, p 53-57, May 1975 2 fig, 2 tab, 11 ref.

Descriptors: Environmental effects, *Temperature, Biochemistry, Biodegradation, *Thermal stress, Microorganisms, Sea water, *Chemical degradation, Asia.
Identifiers: *Hexadecane decomposition, Japan.

The thermal alteration of microbial activity was studied on hexadecane decomposition by microorganisms in salt water of a natural pool of Shimogamo Hot Spring. A significant linear relationship existed between the logarithm of the in situ potentiality of hexadecane decomposition and temperature. The regression line was determined statistically within the temperature range of 42.8 - 63.9C in the pool. The rate of hexadecane decomposition in salt water of the pool was approximately 10 microg hexadecane/1/hr. (Chilton-ORNL)
W77-00876

RELATIONSHIP OF VIBRIO PARAHAEMOLYTICUS IN OYSTERS, WATER, SEDIMENT, AND BACTERIOLOGICAL AND ENVIRONMENTAL INDICES,
Texas A and M Univ., College Station. Dept. of Animal Science.
C. A. Thompson, C. Vanderzant, and S. M. Ray.
Journal of Food Science, Vol. 41, 1976, p 117-122, 11 fig, 1 tab, 19 ref.

Descriptors: Environment, *Pathogenic bacteria, Aquatic life, Marine microorganisms, *Oysters, Sediments, Bacteria, Water pollution effects, *Bioindicators.
Identifiers: *Vibrio parahaemolyticus.

153 samples of oysters, water and sediment were tested and of these 61.4% resulted in positive tests for Vibrio parahaemolyticus. The pathogen was present in 59.3% of the oyster samples, 49% of the water samples, and 76% of the sediment samples. No significant correlation was found between V. parahaemolyticus and the various bacteriological and environmental parameters. (Chilton-ORNL)
W77-00877

THE TEMPERATURE OF TWO WELSH LAKES AND ITS EFFECT ON THE DISTRIBUTION OF TWO FRESHWATER INSECTS,
University Coll. of North Wales, Bangor. Dept. of Zoology.
J. E. Brittain.
Hydrobiologia, Vol. 48, No. 1, 1976, p 37-49, 1 fig, 25 ref.

Descriptors: Environmental effects, *Temperature, *Lakes, Freshwater, *Distribution, Insects, Mayflies, Stoneflies, *Aquatic insects, Water pollution effects.
Identifiers: *Wales.

Over a two year period of the study, temperature regimes in the littoral zones of two lakes in North Wales were found to be similar despite the different situations of the two lakes. Although regional weather factors seemed to be of more importance than local variations it was noted that in warm anticyclonic summer weather when water temperatures exceeded 20C during the day the temperature fell to below 20C in Llyn Dinas during the night, while Llyn Coron often remained above 20C throughout the night. Two common species, Nemoura avicularis Morton and Leptophlebia vespertina (L.), in Llyn Dinas were absent from Llyn Coron. Investigations of nymphal temperature tolerance and the effect of temperature on egg development and emergence led to the conclusion the differences in temperature regime between the two lakes were insufficient to explain the absence of the two species from Llyn Coron. (Chilton-ORNL)
W77-00878

HYDRAZINE DEGRADATION IN AQUATIC SYSTEMS,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
A. R. Slonim, and J. B. Gisclard.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 3, 1976, p 301-309, 6 tab, 9 ref.

Descriptors: *Chemical degradation, Aquatic environment, Water pollution effects, Fish, Analytical techniques, Organic matter, Biodegradation, Pollutant identification.
Identifiers: *Hydrazine degradation.

A polarographic technique was developed to determine if hydrazine is stable or degrades in various types of aquatic systems. Three experiments reported consisted of analyzing hydrazine in water from very dirty water filled with much organic debris following a rainstorm to clear, softened municipal water. Addition of hydrazine showed that, within the first couple of hours, the most polluted water caused a hydrazine breakdown to below one-third of its original level. The rate of degradation was highest within the first 24 hours in those samples showing immediate change in hydrazine content, and the hydrazine concentration approached its lowest level on the second day. Clear, soft water containing no organic matter did not degrade hydrazine until the second day and only about 35% by the fourth day. To investigate the extent to which hydrazine is taken up by fish, hydrazine concentration was compared between water samples with and without guppies. In hard water, differences between the samples increased with time while no detectable difference was found in soft water. (Chilton-ORNL)
W77-00879

SEASONAL TEMPERATURE EFFECTS AND PREDICTING DEVELOPMENT RATES OF MARINE COPEPOD EGGS,
Washington Univ., Seattle. Dept. of Oceanography.
M. R. Ladry.
Limnology and Oceanography, Vol. 20, No. 3 May 1975, p 434-440, 3 fig, 1 tab, 20 ref.

Descriptors: Environmental effects, *Temperature, *Seasonal, *Marine animals, *Growth rates, Eggs, *Copepods, *Forecasting, Resistance, *Heat resistance.
Identifiers: Acclimation temperature, *Acartia clausi eggs.

The purpose was to show that the development of Acartia clausi eggs is affected by seasonal temperature acclimation of the female copepod. Eggs from animals collected at 8-10C showed significantly faster development rates under conditio of 15-20C than did those collected at 18-20C. It suggested that when temperature acclimation a tolerance effects are considered, the relative e development of arctic and temperate mari copepods follows the same temperature depende function rather than individual unique functio (Chilton-ORNL)
W77-00880

REVEALING CERCARIA OF THE FAMI SCHISTOSOMATIDAE IN THE KIEV WAT RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instyt Hidrobiologii.
M. I. Chernogorenko.
Med Parazitol Parazit Bolezn 44(2), p 222-2 1975.

Descriptors: Reservoirs, *Trematodes, Inv tebrates, *Worms, *Animal parasites, *Mollus Larvae, Fish diseases.
Identifiers: Bilharziella-polonica, Coretus, Ly naea-stagnalis, Physa, Rudix, *Schistosomatid Trichobilharzia-ocellata, Ukrainian-SSR, *K Reservoir(USSR).

High rates of mollusc infestation with tremato larvae of the family Schistosomatidae were served in the 1st years of existence of the K water reservoir (Ukrainian SSR, USSR). In s sequent years it decreased considerably due decreased parasite density as a result of decrea water levels and drainage of shallow waters. T maximum excretion of Trichobilhazgia ocell cercariae from molluscs Lymnaea stagnalis occ in the morning and evening hours. Bilharzi polonica, Rudix, Coretus and Physa were a found.—Copyright 1976, Biological Abstracts, I
W77-00881

DIVERSITY OF MARINE INVERTEBRATES A THERMAL EFFLUENT,
Delaware Univ., Lewes. Coll. of Marine Studies
D. T. Logan, and D. Maurer.
Journal Water Pollution Control Federation, V 47, No. 3, March 1975, p 515-523, 5 tab, 2 fig, ref.

Descriptors: *Environmental effects, *Ther pollution, *Marine animals, Temperature, Hea water, Water pollution effects, Invertebrates.
Identifiers: *Species diversity.

It has been hypothesized that species diver may be used to determine the effect of a pollut on a community with pollution tending to red the value of the diversity index. Data from study show that an area of unusually high diver may exist in a thermal effluent at the mouth discharge canal. A suggested explanation for condition is that the mouth of the discharge c is subject to large temperature variations. If a l portion of the community at this location destroyed during intermittent, severe temperat changes, the ensuing periods of more stable co tions will be periods of recolonization and th will be little species interaction. No species have gained dominance through interaction diversity may be unusually high in these pio communities. (Chilton-ORNL)
W77-00883

SEASONAL AND LABORATORY VARIATI IN THE HEALTH OF GRASS SHRI PALAEMONETES PUGIO: DODECYL SOD SULFATE BIOASSAY,
Army Engineer Waterways Experiment Stat Vicksburg, Miss. Environmental Effects Lab.
H. E. Tatem, J. W. Anderson, and J. M. Neff.
Bulletin of Environmental Contamination Toxicology, Vol. 16, No. 3, 1976, p 368-375, 2 21 ref.

escriptors: Environmental effects, *Toxicity, esistance, *Shrimp, Laboratory tests, Organic mpounds, *Bioassay, Temperature, Salinity, asonal, Water pollution effects.
entifiers: Dodecyl sodium sulfate, DSS, laemonetes pugio.

e purpose was to determine the seasonal varia- n in the resistance of grass shrimp to dodecyl dium sulfate (DSS) and the organism's response DSS after time in the laboratory. Data indicated t grass shrimp tolerated substantial concentra- ns of DSS in comparison to marine fish and staceans. Palaemonetes tolerated higher levels DSS when collected in spring and summer nths and showed significant decreases in re- tance to the standard toxicant with time in the oratory even while appearing normal and althy. Results suggested that toxicity testing uld be begun as soon as possible after organ- s are collected, with temperature and salinity rameters similar to field conditions. (Chilton-RNL)
77-00884

IE RELATIONSHIP OF MALATHION AND S METABOLITES TO FISH POISONING,
vironmental Protection Agency, Gulf Breeze, a. Gulf Breeze Environmental Research Lab.
H. Cook, J. C. Moore, and D. L. Coppage.
lletin of Environmental Contamination and xicology, Vol. 16, No. 3, 1976, p 283-290, 3 tab, ref.

escriptors: Environmental effects, *Pesticides, sh, Metabolism, *Bioassay, Enzymes, ochemistry, Laboratory tests, Mortality, oxicity, Water pollution effects, Pollutant ntification, Monitoring.
entifiers: *Malathion, Malaoxon.

e purpose was to determine the relation of ort-term measurability of malathion and some of metabolites in fish to poisoning of fish in the oratory. Degree of poisoning was determined brain acetylcholinesterase inhibition and deaths exposed populations. Residues of malathion or laoxon were not found in any body tissue in ncentrations greater than 0.10 microg/g after 24 exposure to 75 microg malathion/l. However, lathion monoacid and diacid were found in all sues with the greatest residues in gut and liver, licating rapid conversion of malathion to other mpounds. The data showed accumulation of noacid in the gut that coincided with phosphor- tion of acetylcholinesterase in brain and isoning in short-term continuous exposure to atively constant levels of malathion in seawater. was concluded that monitoring by chemical alyses of sensitive fishes or water for malathion malaoxon would not show poisoning caused by zyme-bound metabolites but that analysis for lathion monoacid in gut and measurement of in acetylcholinesterase activity in fish would be practical measure of poisoning caused by lathion. (Chilton-ORNL)
77-00885

IE EFFECT OF GRAVEL DREDGING ON ESERVOIR PRIMARY PRODUCTION, IN- RTEBRATE PRODUCTION, AND MUSSEL ODUCTION.
nnessee Wildlife Resources Agency, Nashville.
Yokley, Jr., and C. H. Gooch.
mpletion Report, August 1976. 38 p, 14 fig, 4 . PL88-300, Proj. 2-245-R.

scriptors: *Water pollution effects, *Dredging, eservoirs, *Gravels, *Mussels, *Aquatic life, diments, *Primary productivity, Invertebrates, ennessee River.
entifiers: Substrates.

e objectives of this study were to find those thods and organisms that reveal best the effects gravel dredging on the biotic communities. The resilience of the Tennessee River is not the same along its length nor are the organisms equally capable of bouncing back to their original densities. Plankton appears to be least affected by the gravel dredging when comparing those organisms studied. Also the fast moving water continually restores the lost plankton almost immediately after it is lost. Recruitment of any lost plankton occurs very quickly. The macrobenthos, including arthropods, annelids, flatworms, and coelenterates are also quickly replaced from surrounding populations as colonization or artificial substrates indicates, but silt does reduce the densities of these organisms below dredging. Freshwater mussels are sedentary and have low resilience requiring much longer time to bounce back. Many of the fish species that serve as hosts to freshwater mussels are not tolerent to silt. The ecological role of mussels has not been completely evaluated but it is known that the quality of water they inhabit is usually good. Mussels do filter suspended or organic matter from the water and improve its quality for fish and other swimming forms. (NOAA)
W77-00895

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 1. MARINE MAMMALS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00901

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 2, MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00902

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 3. MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00903

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 4. MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00904

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 5. FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00905

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 6. FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-00906

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 7. FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-00907

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 8, EFFECTS OF CONTAMINANTS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-00908

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 9. CHEMISTRY AND MICROBIOLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-00909

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 10. CHEMISTRY AND MICROBIOLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-00910

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME II. PHYSICAL OCEANOGRAPHY AND METEOROLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00911

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 12. GEOLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00912

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 13. GEOLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00913

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 14. ICE.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 6G.
W77-00914

AN ECONOMIC ANALYSIS OF THE ENVIRONMENTAL IMPACT OF HIGHWAY DEICING,
Abt Associates, Inc., Cambridge, Mass.
D. M. Murray, and U. F. W. Ernst.
Report EPA-600/2-76-105, May 1976. 137 p. 15 fig., 8 tab., 331 ref., 2 append. 68-03-0442.

Descriptors: *Snow removal, *Salts, *Highway icing, *Costs, *Damages, Water supply, Trees, Bridges, Corrosion, Groundwater, Public health, Water pollution effects, Cost comparisons, Air pollution.
Identifiers: *Highway deicing, Automobile corrosion.

The effects of salt use for highway deicing and snow removal on water supplies, lakes, and rivers; on trees and other vegetation; on bridges; on vehicles; on underground power transmission lines; and on public health are discussed. By analyzing available data it is estimated that the minimal an-

nual costs of salt use to the snowbelt states approximates $3 billion, distributed as follows: Surface and groundwater water supplies with the potential for irreversible public health damage to the hypertension-sensitive segment of the population - $150 millions; vegetation - $50 millions; highways and bridges - $500 millions; vehicles - $2000 millions; underground power transmission lines - $10 millions; and salt purchases and application - $200 million. The damage cost is almost 15 times the annual national budget for the purchase and application of road salt, and about six times the entire annual national budget for snow and ice removal. It is recommended that the level of salting be reduced by an amount determined by local conditions and that greater emphasis should be placed on plowing and sanding snow removal methods. Educational programs should be instituted to alert the public to the extent of salt damage and greater emphasis should be placed on driver training under winter conditions. (Auen-Wisconsin)
W77-00923

AQUATIC OLIGOCHAETA RECOREDED FROM CANADA AND THE ST. LAWRENCE GREAT LAKES,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 2H.
W77-00925

MUNICIPAL PHOSPHORUS LOADINGS TO LAKE ERIE, AN EVALUATION STUDY PREPARED FOR THE GREAT LAKES WATER QUALITY BOARD.
International Joint Commission-United States and Canada, Windsor (Ontario). Great Lakes Water Quality Board.
For primary bibliographic entry see Field 5B.
W77-00926

ASBESTOS IN THE GREAT LAKES BASIN WITH EMPHASIS ON LAKE SUPERIOR, A REPORT TO THE INTERNATIONAL JOINT COMMISSION FROM THE GREAT LAKES RESEARCH ADVISORY BOARD.
International Joint Commission-United States and Canada, Windsor (Ontario). Great Lakes Water Quality Board.
For primary bibliographic entry see Field 5B.
W77-00927

CLADOPHORA IN THE GREAT LAKES,
Limnos Ltd., Toronto (Ontario).
J. Neil.
International Joint Commission, Great Lakes Research Advisory Board, Workshop Proceedings, February 19-21, 1975, Windsor, Ontario, H. Shear and D. E. Konasewich, editors. 188 p.

Descriptors: *Chlorophyta, *Cladophora, *Great Lakes, *Conferences, *Nuisance algae, History, Habitats, *Distribution, *Biomass, Photosynthesis, Phosphorus, Nitrogen compounds, Economic impact, Beneficial use, *Standing crops, Remote sensing, *Productivity, *Nutrient requirements, Food chains, Chemical properties, Radioisotopes, Heavy metals, *Absorption, Pesticides, Bioassay, Growth rates, Niches, Ecology, *Algal control, Nutrient removal, Harvesting, Chemcontrol, Biocontrol, International Joint Commission.

Everything you want to know about Cladophora--its history in the Great Lakes, distribution, biomass standing crop and production, its ecological and chemical requirements, its growth rates in response to temperature, its uptake and accumulation of cations, and its nutrient requirements--are discussed in this workshop proceedings. Presentations also relate to Cladophora's propensity to accumulate heavy metals, pesticides, and radionuclides and the effects of that uptake on the food chain, the possible utilization of this bioaccumulation as a pollutant removal agent, and as a bioassay eutrophication indicator. Also detailed are the ecology of the Cladophora niche, and effectiveness of control methods, including phosphorus limitation, physical removal, chemical and biological control. The socio-economic impact of this nuisance algae is related to impaired water use, reduction of recreation value, devaluation of property, and effects on fisheries. Potential beneficial uses of Cladophora may be as animal fodder, as fertilizer and mulch, utilization of its biocidal products, as a fiber for paper-making, and for treating waste effluents containing low levels of heavy metals and radioactive substances. (Auen-Wisconsin)
W77-00928

WATER POLLUTION INVESTIGATION: BLACK RIVER OF NEW YORK.
Hydroscience, Inc., Westwood, N. J.
For primary bibliographic entry see Field 5B.
W77-00929

AN APPROACH TO A RELATIVE TROPHIC INDEX FOR CLASSIFYING LAKES AND RESERVOIRS. (A PRELIMINARY ANALYSIS OF NATIONAL EUTROPHICATION SURVEY DATA COLLECTED DURING THE 1972 SAMPLING PERIOD).
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-242 336, Price codes: A04 in paper copy, A01 in microfiche. Working Paper No. 24, December 1974. 44 p, 1 fig, 6 tab, 10 ref, append.

Descriptors: *Trophic level, *Lakes, *Classification, Phosphorus, Nitrogen, Secchi disks, Chlorophyll, Dissolved oxygen, Methodology, *Reservoir.
Identifiers: *Trophic index system.

A lake Trophic State Index, incorporating the parameters of total phosphorus, dissolved phosphorus, inorganic nitrogen, Secchi disc, minimum dissolved oxygen, and chlorophyll-a, and ranging from 0 to 594 was developed to classify 209 lakes and reservoirs in the northeast and north-central states by using the data collected by the National Eutrophication Survey. Lakes with a Trophic Index Number of 500-594 were oligotrophic while those with an index number of 420-499 were mesotrophic. Below an index number of 420, the lakes became progressively more eutrophic with the lower index numbers corresponding to a higher potential for developing nuisance algae. Lakes in which the eutrophication problem is primarily aquatic macrophytes generally do not fit this index system; however, this is generally true of similar classification systems. For phosphorus limited lakes, the proposed Trophic Index Numbers correspond well to Vollenweider's (1973) phosphorus loading-lake morphometry-trophic state relationships. The proposed index system provides a relative method by which previously unclassified lakes could be classified after the appropriate parameters have been measured. The index could also be used to evaluate year to year changes in trophic conditions of a specific lake. The applicability of this index to lakes in other geographical areas is questionable. (Auen-Wisconsin)
W77-00930

NITROGEN AND PHOSPHORUS IN WASTEWATER EFFLUENTS. (A PRELIMINARY ANALYSIS OF NATIONAL EUTROPHICATION SURVEY DATA COLLECTED DURING 1972-73 SAMPLING PERIOD).
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 335, Price codes: A06 in paper copy, A01 in microfiche. Working Paper 22, July 1974. 80 p. 6 tab., 5 ref., append.

Descriptors: *Eutrophication, *Sewage effluents, *Nitrogen, *Phosphorus, Surveys, Alabama, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Kentucky, North Carolina, South Carolina, Ohio, Pennsylvania, Tennessee, West Virginia, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, New Hampshire, New Jersey, New York, Rhode Island, Vermont, Virginia, Wisconsin, Sewage treatment.

A survey of sewage treatment plants in 27 states of the eastern third of the United States indicated that the median total phosphorus content in sewage effluents ranged from 3.4 mg/l to 8.8 mg/l. The lowest concentrations were achieved by those states which either had phosphate detergent bans or were using phosphorus removal processes. Median total nitrogen concentrations by state ranged from 10.46 mg/l to 19.10 mg/l. Median P and N loads, based on population served, were 2.2 lbs total P/capita/yr and 6.0 lbs of total N/capita/yr. Those facilities which specifically practiced phosphorus removal had a median total phosphorus concentration of 2.53 mg/l, less than 50% of the median value of conventional treatment processes. Only 54% of the total phosphorus discharged after primary treatment was dissolved ortho-phosphorus whereas following various types of biological treatment, 72-83% of the total was orthophosphorus, which is readily available to algae. Total nitrogen and ammonia nitrogen concentrations were highest in effluents from primary treatment facilities and lowest in oxidation pond effluents. The average N:P ratio in the effluents of all sampled plants was 2.5:1 and the range 1.9:1 to 5.2:1 for different types of treatment processes. There is little potential for controlling eutrophication by nitrogen removal. (Auen-Wisconsin).
W77-00931

MAN'S EFFECT ON THE QUALITY OF OUR WATER,
Central and Southern Florida Control District, West Palm Beach.
J. Browning.
In Depth Report, West Palm Beach, Vol 1, No 2, 1-8, February 1972. 12 p, 2 tab.

Descriptors: *Water pollution, *Urban runoff, Agriculture, *Water pollution effects, *Runoff, Rainfall-runoff relationships, Storm water, Storms, Storm runoff, Water supply, Water sources, Water pollution control, Administrative agencies, Bacteria, Sewerage.

Background material is presented on pollution as it occurs through agricultural, urban, and storm runoff. South Florida's forecast is encouraging in that the Florida Department of Pollution Control has successfully required non-polluting waste disposal. One remaining problem is that urban runoff bacteria levels in street gutters are extremely high. The optimum solution will be to eliminate much of the trash and debris which finds their way into the waterbodies during rainstorms. Agricultural pollution runoff can be controlled through the use of private, small reservoirs. Tables are given which show characteristics of storm water and pollutant levels according to land use types. (Frank-Florida)
W77-00974

INDEPENDENCE OF THE BIOCHEMICAL AND SPECIES COMPOSITION OF PLANKTON OF THE MINGECHAUR AND VARVARA RESERVOIRS, (IN RUSSIAN),
For primary bibliographic entry see Field 2H.
W77-01018

PHYSICAL-CHEMICAL AND PLANTONOLOGICAL QUANTITATIVE STUDIES O

HE GREAT LAKE OF LAFFREY (YEARS 970, 1971 AND 1973), (IN FRENCH),
ordeaux-3 Univ., Talence (France). Lab. of oology.
. Gachet, B. Serra-Tosio, and J. Tetart.
rav Lab Hydrobiol Piscicult Univ Grenoble 1/65, p 7-24, 1974.

escriptors: *Ions, Lakes, *Phytoplankton, Eu-pe, *Benthos, Zooplankton, Copepods, rustaceans, Eutrophication, Algae.
lentifiers: Anura, Asplanchna, Asterionella-sp, inobryon, Fragilari-sp, France, Notholca, ediastrum, Peridinian, Polyarthra-sp, tephanodiscus, Synedra, *Great Lake of affrey(France).

he principal ions in the lake were studied as a nction of depth, at various times of the year. nytoplankton was present in large numbers in ake Laffrey (France): up to 1425 individuals/l ear the bottom (30 m). At the surface the nytoplankton population was 885 individuals/l. he phytoplankton was represented principally by sterionella sp. and Fragilaria sp. The forgme is entiful near the surface, while the second ominates at 12-20 m. Pediastrum and Dinobryon . remain localized below 6 m. Synedra abounds the surface and disappears at 4 m, reappearing 20 m. Stephanodiscus sp. appear only at the bot-m, while the peridinians develop between the rface and 30 m. The zooplankton is made up of otifers and crustaceans. The rotifers are generally ound near the top. Asplanchna is absent at the rface but present between 2 and 12 m. Anura sp. re most numerous near the surface; Polyarthra . appears at 10-15 m; Notholca is scarce near the rface and reaches a maximum at 6 m. The rustaceans are regrouped into Cladocera and opepoda; the latter include Cyclopoids, Cala-oids and nauplii stages. A clear predominance of iatoms is reported compared with other plank-onic algae, which shows that the lake has not eached an advanced state of eutrophication.
77-01019

COMPARISON OF BENTHIC COMMUNITIES F STRUJNJAN AND KOPER BAYS WITH RE-ARD TO THEIR DIFFERING EXPOSURE TO OLLUTION STRESS, (IN SLOVENIAN),
jubljana Univ. (Yugoslavia). Morska Biologijo ostaja.
. Avcin, N. Mith-Avcin, A. Vukovic, and B. riser.
iol Vestin 22(2), p 171-207, 1974.

escriptors: Bays, Europe, Biomass, Benthos, ewage, Water pollution effects, Algae, olerance.
lentifiers: *Cymodocea-Nodosa, Halopithys-In-rvus, Ulva-Rigida, Y. goslavia, Koper ay(Yugoslavia), Strujnjan Bay(Yugoslavia).

lant biomass data and measures of diversity and milarity of benthic species from transection sam-es of 2 coastal bays in the north Adriatic ugoslavia) are compared and analyzed. Until cently, the bays were floristically and faunisti-lly nearly identical, but one of them is now eavily polluted by raw sewage from the town of oper. Strunjan Bay, representing natural condi-ons, is characterized by a sea grass (Cymodocea odosa) community which covers most of the bot-m to a depth of 8 m, below which a rich infaunal ommunity within the soft clay sediments is ound. In the shallow, heavily-polluted part of oper Bay, C, nodosa has been eliminated and the sulting space is now inhabited by the algae Ulva gida and Halopithys incurvus. The total number species found to a depth of 4 m is reduced to lf of that of the analogous portion of Strunjan ay. The remaining, pollution-tolerant species are presented in huge number up to 20,000 m2, robably largely due to the elimination of preda-rs. The area of maximum pollution is limited to e inner part of Koper Bay. The community com-osition from deeper areas (8-10 m) does not differ from the analogous part of Strunjan Bay.--Copyright 1976, Biological Abstracts, Inc.
W77-01024

GROWTH AND PRODUCTION OF MASS SPECIES OF CHIRONOMIDS (DIPTERA, TENDIPEDIDAE) IN THE VOLGA PRE-DELTA, (IN RUSSIAN),
Kaspiiski Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
M. S. Aleksevnina.
Zool Zh 53(5), p 720-727, 1974.

Descriptors: Biomass, *Diptera, Larvae, *Productivity, *Growth rates, Deltas.
Identifiers: Fleuria-Lacustris, Polypedilum-Nubeculosum, *Tendipedidae, *Volga pre-delta(USSR).

Production is calculated for 3 mass species of chironomid larvae in the Volga pre-delta (USSR): Polypedilum nebeculosum, Fleuria lacustris, Chironomus sp. (form semireductus-plumosus). The calculation was based on A.S. Konstantinov's method of summation of relative diurnal increments of larval biomass during a definite period. The production of the species in question was 16.0-34.7 times higher than the average biomass during the same period. The ratio between the production and the maximum biomass (P/B max) attained 2.0-6.8 P. nubeculosum characterized by a short life cycle and high numbers had high values of P/B max (6.8 and 5.3). These values were lower in F lacustris and Chironomus sp. characterized by a slower development rate (2.9 and 3.4, 2.9 and 3.1, respectively). These values match those for eutrophic water bodies. The production of F. lacustris calculated by the graphic method (Vinberg, 1968) agrees with the values obtained.--Copyright 1976, Biological Abstracts, Inc.
W77-01025

PLANKTON COMMUNITIES OF THREE MAZURIAN LAKES AND CHLOROPHYLL CONTENT IN THEIR PHYTOPLANKTON, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
J. Sosnowska.
Monogr Bot 42, p 1-152, 1974.

Descriptors: *Phytoplankton, *Chlorophyll, Europe, Lakes, Eutrophication, Mesotrophy, Dystrophy, Water.
Identifiers: *Poland(Mazurian Lakes).

Plankton communities were investigated, with particular interest in the phytoplankton of 3 lakes in the Mazurian Lakeland county (NE Poland): b-mestrophic Lake Harsz, eutrophic Lake Lemiet and dystrophic Lake Smolak. The plankton communities of these lakes are characterized from the socialogical point of view and the quantitative results concerning phytoplankton are compared using 3 methods: the sociological method, counting the quantity of individuals per liter of water and chlorophyll measurements.--Copyright 1976, Biological Abstracts, Inc.
W77-01029

LIPID TRANSFORMATION IN SEAWATER BY OIL-OXIDIZING MICROORGANISMS, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR). Dept. of Marine Sanitation Hydrobiology.
For primary bibliographic entry see Field 5A.
W77-01030

ENZYMATIC IN SITU MEASUREMENTS: NEW SEAWATER AND SEDIMENT MEASUREMENT METHODS, (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskude.
For primary bibliographic entry see Field 5A.
W77-01031

NUMBER AND BIOMASS OF OLIGOCHAETA OF THE SPECIES POTAMOTHRIX HAMMONIENSIS MICH. IN LAKES DUSIA, GALSTAS, OBELIJA AND SLAVANTAS IN 1968-1971, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
A. I. Grieyalis.
Liet Tsr Nokslu Akad Darb Ser C Biol Mokslai 2, p 53-59, 1975.

Descriptors: *Biomass, *Lakes, Europe, *Oligochaetes, *Temperature.
Identifiers: Lake Dusia, Lake Galstas, *Lithuanian-SSR, Lake Obelija, *Potamothrix-Hammoniensis, Lake Slavantas, USSR.

The largest number P. hammoniensis Mich. in 1969 and 1970 was in Lake Dusia (Lithuanin SSR, USSR). The number varied in the wide boundary from 600-1400 worms/m2. The smallest number of oligochaete biomass was in Lake Slavantas, especially in 1970. The largest oligochaete biomass was in Lake Dusia which is of average thermal depth. The smallest biomass was in thermal deep Lake Slavantas. The largest average weight (9.55-10.00mg) of P. hammoniensis was in thermally shallow Lake Obelija in Feb. 1968. The largest specimens (20-29 mm in length) were in thermally shallow Lake Obelija and in Lake Dusia. P. hammoniensis comprised the largest part of the zoobenthos (80-90%) in the average lakes and the smallest part of the zoobenthos (15-50%) in thermally shallow Lake Obelija and in thermally deep Lake Slavantas (0.1-24.8%).--Copyright 1976, Biological Abstracts, Inc.
W77-01033

THE TIME AND THE CAUSE OF EXTERMINATION OF LAKE BALLS FROM LAKE ZELLER, (IN JAPANESE),
Yamagata Univ. (Japan). Dept. of Biology.
S. Nakazawa.
Bull Jpn Soc Phycol 22(3), p 101-103, 1974.

Descriptors: *Cladophora, Lakes, Europe, Fishing, Succession, Water pollution, Beaches, Nets.
Identifiers: *Cladophora-Sauteri, *Lakes balls(Cladophora), *Lake Zeller(Austria).

Reports of Sauter, Lorenz, Keissler, a letter of the Mayor Alois Latini of Zell am See, and original investigation of Lake Zeller (Austria) in 1972, were compared. The lake balls of Cladophora sauteri were apparently exterminated from Lake Zeller between 1900-1909. The cause of the extermination may be a combination of several factors: natural succession, change in water by human contamination, loss of shallow beaches by embankment and mechanical damage of the lake bottom by fishing nets.--Copyright 1976, Biological Abstracts, Inc.
W77-01034

STUDIES ON THE INCIDENCE OF ENCYSTED LARVAE OF PARAGONIMUS MIVAZAKII KAMO ET AL, 1961 IN THE CRAB POTAMON DEHAANI IN SHIZUOKA PREFECTURE, JAPAN, (IN JAPANESE),
Shizuoka Univ. (Japan). Hygiene Lab.
J. Ito, and H. Mochizuki.
Jpn J Parasitol 24(4), p 241-249, 1975.

Descriptors: *Human diseases, Asia, Larvae, *Crabs, Water pollution effects.
Identifiers: *Japan, *Paragonimus-miyazakii, *Potamon-dehaani, Shizuoka Perfecture.

Humans have become infected with P. mivazakii due to contact with contaminated P. dehaani. Of 1874 crabs (P. dehaani) collected in Shuizuoka Prefecture, Japan, and examined for metacercariae of P. mivazakii, 275 (14.7%) were positive. The dis-

tribution was limited to the western half of the prefecture. The highest incidence rate found in the Ooi River basin (34.4%); rates were 13.4% in Oota River, 31.7% in Tenryu River and 1.7% in Miyakoda River. The number of cysts per crab host was 1-24, with an average of 3.3. Metacercariae were most often found in the pericardial cavity, usually attached to the heart of the crab. No correlation between infection rate and size or sex of the crab was observed.--Copyright 1976, Biological Abstracts, Inc.
W77-01036

STUDIES ON THE BOTTOM FAUNA OF FIVE LAKES IN SOUTHERN HOKKAIDO (LAKES HIKOTSU-KO, KUTTARA-KO, TOYA-KO, HANGETSU-KO AND OSHIMA O-NUMA, (IN JAPANESE),
Mieken Science Education Center, Yokkaichi (Japan).
N. Kitagawa.
Jpn J Limnol 36(2), p 48-54, 1975.

Descriptors: *Lakes, Asia, *Bottom deposits, Benthos, Mesothropy, Chironomids, Dissolved oxygen, Larvae.
Identifiers: *Chironomus-plumosus, Hangetsu-Ko, Hokkaido, *Japan, Kuttara-ko, Lakes, O-numa, Oshima, Procladius-sp, Shikotsu-ko, Toya-ko, *Tubifex-sp, Profundal zone.

In Lake Shikotsu-ko, only Tubifex sp. occurred in the profundal zone deeper than 350 m. Some kinds of chironomid larvae were found in the littoral zone. The dissolved O2 is rich throughout. In Lake Kuttara-ko, no macroscopic animals were found deeper than 138 m. Tubifex sp. occurred in the zone shallower than 138 m, though not abundant. Transparency was 18 m. This is the highest value of the 9 lakes in Hokkaido (Japan) investigated. In Lake Toya-ko, some kinds of chironomid larvae were found in the littoral zone, but not in the profundal zone. Tubifex sp. occurred widely over the bottom. In Lake Hangetsu-ko, no macroscopic animals were found on the bottom. The deoxygenated layer extends for several meters at the deepest zone. In Lake Oshima O-numa, Chironomus plumosus is dominant in the profundal zone. This lake is a mesotrophic plumosus lake.--Copyright 1976, Biological Abstracts, Inc.
W77-01037

THE PHYSICAL-CHEMICAL CONDITIONS OF THE WATERS OF THE LAKE OF ORTA DURING THE PERIOD FROM 1964 TO 1970, (IN ITALIAN),
F. M. Biffi, M. Picotti, and D. Tajana.
Boll Pesca Piscic Idrobiol 27(1), p 1-42, 1972.

Descriptors: *Lakes, Europe, Epilimnion, Hypolimnion, *Carbon dioxide, Ions, Oxidation, Oxygen, Phytoplankton, Heated water, Hydrogen ion concentration.
Identifiers: *Italy(Lake of Orta).

Thermal inversion in the waters (in Italy) occurs annually in later winter and reaches the greatest depths every year. The oxygenation of the epilimnion is normal; that of the hypolimnion is scanty especially in the period of summer-autumn stratification. The deep layers always show high CO2 content, which decreases at the end of the winter period after the exchange of the deep waters. In the surface layers the CO2 content is fairly normal with a siight increase in the period in which the ascent of the deep water layers occurs. Similar behavior is shown by the pH. NH4 in view of the H+ concentration, is present in ionic equilibrium with anions of the available acids, especially carbonic acid. NO2, as intermediate products of physico-chemical and biological oxidation have a concentration stabilized around 3000 gamma (3000 micro g/l, with a tendency, in recent years, to decrease through phytoplankton consumption. Cu and Cr contents are also given.--Copyright 1976, Biological Abstract, Inc.
W77-01038

DISTRIBUTION OF THE PHYTOPHYLIC INVERTEBRATES AND METHODS OF THEIR QUANTITATIVE ESTIMATION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
Gidrobiol Zh. (6), p 51-58, 1973.

Descriptors: *Distribution, *Invertebrates, *Zooplankton, Estimating.
Identifiers: Ceriodaphnia-pulchella, Chydorus-sphaericus, Eucyclops-serrulatus, Eurytemora-velox, Glyceria-sp, Polyphemus-pediculus, Potamogeton-sp, Quantitative, Scapholeberis-mucronata, Sida-crystallina, Simocephalus-vetulus, *Phytophylic invertebrates.

Zooplankton occurrence obeys the law of normal distribution. The accuracy of quantitative zooplankton estimation with 9-10 samples taken, when sample volume is convenient, reaches 8-10%. The estimation accuracy depends on the characteristics of the substrate, as well as on biological and ecological zooplankton (Sida crystallina, Simocephalus vetulus, Ceriodaphnia pulchella, Scapholeberis mucronata, Chydorus sphaericus, Polyphemus pediculus, Eucyclops serrulatus, Eurytemora velox) peculiarities, e.g., its ability to form shoal. The irregular distribution of the zooplankton is described by the coefficient of variation. The estimation accuracy increases when the greatest variety of size and ecologically different aggregations, all forming a phytophylic biocenosis, is covered by the survey. (Samples from Glyceriasp., Zander and Potmmogeton sp. were used.).--Copyright 1976, Biological Abstracts, Inc.
W77-01040

DISTRIBUTION AND SIGNIFICANCE OF FECAL INDICATOR ORGANISMS IN THE UPPER CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
G. S. Saylor, J. D. Nelson, Jr.,, A. Justice, and R. R. Colwill.
Applied Microbiology, Vol 30, No 4, October 1975, p 625-638, 7 tab, 8 fig, 13 ref.

Descriptors: *Water pollution effects, *Water quality, Waste water(Pollution), Domestic wastes, Sewage, Environmental effects, Shellfish, Recreation, Temperature, Salinity, Bays, *Chesapeake Bay, *Bioindicators, *Distribution, Coliforms, Bacteria, Enteric bacteria, Streptococcus, Aerobic bacteria.
Identifiers: Heterotrophic bacteria.

The survey reported upon provides evidence of significant levels of pollution from human wastes in the water, sediment, and suspended sediment throughout the Upper Chesapeake Bay. Highest counts of pollution indicator organisms were found at the confluence of the Susquehanna River and the Chesapeake Bay. Organisms were found to be quantitatively distributed independently of temperature and salinity and were not correlated with concentration of suspended sediment. However, 53% of total viable bacteria and more than 80% of fecal indicator organisms were directly associated with suspended sediments. Correlation coefficients for the indicator organisms ranged from 0.80 for bottom water to 0.99 for suspended sediment. Prolonged survival for the fecal streptocci was seen in most of the sediment samples. Further deterioration in water quality would seriously affect shellfish harvesting and recreational uses of the Upper Chesapeake Bay. (Chilton-ORNL)
W77-01061

HYDROGEN ION CONCENTRATION IN THE GASTROINTESTINAL TRACT OF CHANNEL CATFISH,
Georgia Agricultural Experiment Station, Savannah.
J. W. Page, J. W. Andrews, T. Murai, and M. W. Murray.
Journal of Fish Biology, Vol. 8, 1976, p 225-228, 2 tab, 8 ref.

Descriptors: Biochemistry, *Aquatic animals, Fish, *Hydrogen ion concentration, Laboratory investigations, Temperature, *Channel catfish, Water pollution effects.
Identifiers: Gastrointestinal tract(Catfish).

Two groups of five channel catfish, with average weights of 892 and 134 g, were maintained at environmental temperatures of 23 and 28C. Highly acidic conditions were present in the stomachs of all fish with slightly higher pH values for the stomach contents of fish at 28C. The pH values increased to 7-9 in the duodenum and reached a maximum level of 8.6 in the upper intestinal region with a decrease approaching neutrality in the lower segments of the colon. Catfish of both sizes had a slightly lower pH throughout the intestinal tract at 28C than at 23C. The pH of the bile ranged from 6.1 to 7.5 and was higher in fish maintained at 28C. (Chilton-ORNL)
W77-01062

SEASONAL SHIFTS IN THE SPAWNING SITE OF A NORTHEAST PACIFIC INTERTIDAL FISH,
British Columbia Univ., Vancouver, B. C. Inst. of Animal Resource Ecology.
For primary bibliographic entry see Field 2L.
W77-01063

SEASONAL DISTRIBUTIONS OF LARVAL FLATFISHES (PLEURONECTIFORMES) ON THE CONTINENTAL SHELF BETWEEN CAPE COD, MASSACHUSETTS, AND CAPE LOOKOUT, NORTH CAROLINA, 1965-66,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Lab.; and National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 2L.
W77-01064

MIXED FUNCTION MONOOXYGENASE OF FISH AS AN INDICATOR OF POLLUTION OF AQUATIC ENVIRONMENT BY INDUSTRIAL EFFLUENT,
Oulu Univ. (Finland). Dept. of Pharmacology.
J. T. Ahokas, N. T. Karki, A. Oikari, and A. Soivio.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 3, 1976, p 270-274, 1 tab, 18 ref.

Descriptors: Environmental effects, Water pollution, *Water pollution effects, Waste water(Pollution), Wastes, Industrial wastes, Fish, Aquatic environment, Enzymes, Pollutant identification, *Bioindicators, *Metabolism, *Pikes.
Identifiers: *Monooxygenase.

The pike (Esox lucius L.) was used to determine whether or not fish in polluted water have a higher in vitro capacity to metabolize foreign compounds than those in clean water. The overall trend, contrary to what had been previously reported, was that the fish from the polluted water showed reduced in vitro mixed function monooxygenase (MFO) capacity. Preliminary exposure studies in which two other species of fish (Salmo trutta lacustris and Salmo gairdneri) were exposed to the polluted water on one and four week periods, did not develop changes such as those seen in pike chronically exposed to the contaminated water. (Chilton-ORNL)
W77-01065

D. Waste Treatment Processes

FILTRATION LAGOONS FOR TERTIARY EATMENT OF STABILIZATION POND EF-UENT,
uth Dakota State University, Brookings. Dept. Civil Engineering.
N. Dornbush.
ailable from the National Technical Informa-n Service, Springfield, VA 22161, as PB-259 , Price codes: A03 in paper copy, A01 in crofiche. South Dakota Water Resources search Institute, Termination Report, March 76. 38 p, 3 fig, 4 tab, 6 ref, 3 append. OWRT A-I-SDAK(1). 14-31-0001-5042

scriptors: Suspended solids, Nitrogen com-unds, *Tertiary treatment, *Oxidation lagoons, fluents, *Induced infiltration, Nutrient removal, ater reuse, *Water quality standards, *Waste ter treatment, Water pollution, *Infiltration es, Nitrogen, Phosphorus, Coliforms, ochemical oxygen demand.
ntifiers: *Stabilization ponds, *Infiltration oons, Ammonia nitrogen, Nitrate nitrogen.

iltration lagoons were designed and operated to ke maximum use of an in-place soil system to vide advanced treatment of stabilization pond luents in order to meet future effluent stan-rds. After a three-month period of summer eration of the pilot infiltration-percolation ins, the following preliminary conclusions are ggested. Preliminary lysimeter studies demon-ated that a high degree of treatment was pro-ed by soil filtration although infiltration rates e to two inches per day) in these studies were low to be practical for a full-scale operation. arified pilot infiltration-percolation basins, erated with weekly applications of 18 and 24 hes of stabilization pond effluent were able to intain infiltration rates in excess of 0.5 inches hour throughout the summer. The original ver of alfalfa and brome grass maintained infil-tion rates in excess of one inch per hour and p growth thrived. Infiltration rates would not pear to be a deterrent factor in the design of ctical, economical, infiltration-percolation ins. An effluent standard with concentrations 10 mg/l of BOD5 and suspended solids would bably be met with a full-scale infiltration- per-ation basin during the summer if it were con-ucted to preclude short-circuiting of wastewater the ground water drains. With weekly applica-ns of wastewater the oxidation of ammonia rogen to nitrates was indicated. Ammonia rogen reductions were accomplished and the ef-ent from the infiltration-percolation basins uld have met a 1.5 mg/l ammonia nitrogen stan-d about 50 percent of the time. Nitrate nitrogen ncentration excess of 10 mg/l might be expected reach the ground water from infiltration-per-ation basins operated on a weekly cycle of stewater application if an adequate underdrain tem were not installed. About 50 percent of the sphorus applied with the wastewater was noved but effluent concentrations frequently ceeded 1.0 mg/l. Leaching of soluble salts from soil is indicated by the higher conductivity of effluent from the pilot basins.
7-00540

NITRIFICATION WITH A BACTERIAL DISC IT,
tional Inst. for Water Research, Pretoria (South ica).
R. Davies, and W. A. Pretorius.
ter Research, Vol. 9, No. 3, p 459-463, March 5. 5 fig, 12 ref.

scriptors: *Denitrification, *Bacteria, Anaero-conditions, Anaerobic bacteria, Chemical reac-ns, *Waste water treatment, *Biological treat-nt.

An enclosed rotating disc unit was operated anaerobically as a denitrifying system, with methanol as the hydrogen donor. The C:N ratio necessary for complete denitrification was 2.6:1. Optimum pH for denitrification lay in the range between 7.0 and 8.5. Q sub 10 values were 1.38 between 10 and 30 C, -2.66 above 30 C and 13.06 below 10 C. (Skogerboe-Colo St)
W77-00550

OZONATION OF AMMONIA IN WASTE-WATER,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
P. C. Singer, and W. B. Zilli.
Water Research, Vol. 9, No. 2, p 127-134, February 1975. 9 fig, 1 tab, 10 ref.

Descriptors: *Waste water, *Ozone, *Ammonia, *Waste water treatment, Phosphates, Municipal wastes, Tertiary treatment.
Identifiers: *Ozonation.

An investigation of the effects of ozone on ammonia in municipal wastewaters is described and discussed relative to the application of ozone for advanced waste treatment. Ammonia is oxidized completely to nitrate, thereby eliminating the nitrogeneous oxygen demand of the waste. In buffered solutions of ammonium chloride, the reaction is first-order with respect to the concentration of ammonia and the rate increases with increasing pH over the range 7-9, and with increasing ozone partial pressure. (Skogerboe-Colo St)
W77-00553

DEFUSING THE SEWAGE STINKBOMB ON THE TYNE.
Surveyor Public Authority Technology, Vol. 147, No. 4365, p 14-15, February, 1976. 1 fig.

Descriptors: *Sewage treatment, *Sewers, *Sewerage, *Storm water, Hydraulic structures, Construction, Pipelines, Rivers, Surface waters, Projects, Costs, *Combined sewers, Waste water treatment, Sewage disposal.
Identifiers: *Tyne River, Great Britain.

The Northumbrian Water Authority's Tyneside Sewerage Scheme is described. The aim of the scheme is to remove the sewage nuisance currently plaguing the Tyne by treating the sewage and then taking it out to sea. Total cost of the project is estimated at 65 million pounds, and project completion is scheduled for 1980. Once the main interceptor sewers are complete, efforts will begin to take pumped sewage from the low-lying areas between the interceptors and the river banks into the interceptor system. The foul sewer system has been designed for the year 2054; thus, everything is oversized for present flows. In the early stages of the scheme, some storm sewage will be accepted through a storm overflow system. The balance of the stormwater will go into the river. As the system reaches design capacity, it will revert gradually to two separate systems. (Kreager-FIRL)
W77-00559

AGGREGATION TREATMENT APPARATUS FOR WASTE WATER,
Denki Kagaku Kogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
S. Motozawa, H. Itoga, H. Wada, and H. Marukawa.
United States Patent 3,970,562. Issued July 20, 1976. Official Gazette of the United States Patent Office, Vol. 948, No. 3, p 1103, July, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Flocculation, *Separation techniques, *Suspended solids, Equipment, Design criteria, Electrodes, Aggregates, Colloids, Metals.

A patent for an apparatus capable of aggregating suspended colloidal solids in waste water is described. The device consists of the following sections: a suspending stage in which metallic particles of metal oxide, or sintered metal oxide carrying an electrical charge opposite to that on the solids in the waste water are suspended in a feed flow of the waste water; an electrical aggregating stage in which the feed flow with suspended particles is passed between oppositely charged electrodes to flocculate oppositely charged particles and colloidal solids; and a separating stage in which the metallic particles are separated from the flocculant-containing water. The suspending and separating stages are formed as an integral unit having an inverted conical upper section and a means for introducing the flocculant-containing flow from the aggregating stage in a tangential direction adjacent to the upper end. A means for removing the collected flocculated matter and effluent water from an interior point of the conical section is also provided. (Kreager-FIRL)
W77-00560

SEWAGE SYSTEM,
B. E. Brennan.
United States Patent 3,972,650. Issued August 3, 1976. Official Gazette of the United States Patent Office, Vol. 949, No. 1, p 203-204, August 1976. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Hydraulic equipment, *Design criteria, Valves, Sewage, Equipment, Waste water treatment.

A patent for a preassembled sewage collection unit designed for connection between a sewage source and a sewage discharge system is described. The sewage collection unit includes: a container having sewage inlet and outlet openings, each associated with a check valve; an air inlet connection and an air vent; a multi-stage valve assembly mounted within the upper portion of the container and connected to the air inlet and air vent; a cam which can be shifted between two limit positions and can be engaged by a pilot valve actuator; a float which can be shifted in response to the level of sewage in the container; and a quick-throw mechanism in the container which is responsive to variations in the level of the float for shifting the cam from one limit position to the other. The multi-stage valve assembly includes a pilot valve connected to the air inlet, a first pneumatically actuated valve connected to the air inlet and responsive to actuation of the pilot valve, and a second pneumatically actuated valve responsive to actuation of the first pneumatically actuated valve for discharging compressed air into the upper portion of the container. (Kreager-FIRL)
W77-00561

ELECTROCOAGULATION SYSTEM FOR REMOVING POLLUTANTS FROM WASTE-WATER,
Swift and Co., Chicago, Ill. (Assignee).
E. R. Ramiriz.
United States Patent 3,969,245. Issued July 13, 1976. Official Gazette of the United States Patent Office, Vol. 948, No. 2, p 657, July 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, *Coagulation, *Electrolysis, Bubbles, Flocculation, Waste treatment.
Identifiers: *Electrocoagulation.

A patent for an electrocoagulation method capable of removing pollutants from raw waste water is described. The method consists of the following steps: providing a bubble supply produced electrolytically by decomposing a flow of waste water; positioning the bubble supply as a cylindrically shaped dense zone of fine bubbles in a direction longitudinal to the flow of waste water; rapidly flowing the waste water through the dense zone of fine bubbles; turbulently contacting the fine bub-

bles with pollutants in the waste water to form a buoyant embryo floc within the waste water; venting the dense bubble zone to the atmosphere to prevent pressure buildup within the zone; removing the unseparated flow of waste water and embryo floc from the dense bubble zone such that some of the buoyant embryo floc is combined into a buoyant full floc; introducing the full floc and waste water into a downstream flotation basin such that the buoyant full floc rises to near the surface of the waste water in a manner approximating a laminar flow; and then clarifying the waste water by separating the full floc from the waste water. (Kreager-FIRL)
W77-00562

TANK CLARIFICATION PLANT,
Rice (F. B.) and Co., Balmain (Australia).
J. R. Kaelin.
Australian Patent 472,050. Issued May 13, 1976. Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 16, p 1546-1547, May 13, 1976.

Descriptors: *Patents, Flow, *Sewage treatment, *Waste water treatment, Equipment, *Design criteria, Water levels, Oxygenation, Separation techniques, Treatment facilities, Tanks.

A patent for a tank clarification plant designed for handling large-scale irregular sewage influx is described. The device consists of the following components: a tank; a liquid circulation member disposed adjacent the lower region of the tank and in the central area thereof; several impeller blades associated with the circulation member for causing liquid in the tank to circulate in a direction from above the impeller blades to the upper level of the liquid in the tank; at least one stationary cutting blade disposed immediately adjacent the liquid circulation member and having leading edges continuously cooperable with the impeller blades of the circulation member for producing a shearing effect therebetween; a conduit in the tank which is open at one end to the exterior of the tank and at the other end immediately above the liquid circulation member for the purpose of introducing oxygen or an oxygen-containing gas mixture into the immediate vicinity of the inlet side of the liquid circulation member; and a means for controlling the liquid level in the tank to insure that the liquid level is always above the liquid circulation member. (Kreager-FIRL)
W77-00563

SLUDGE ELEVATOR FOR FLUID CLARIFICATION SYSTEM,
Cincinnati Butchers Supply Co., Ohio. (Assignee).
F. A. Zaenkert.
United States Patent 3,966,617. Issued June 29, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 5, p 2252, June 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, Equipment, *Design criteria, Liquid wastes, Waste treatment, Sludge.

A patent for a fluid clarification device designed to separate scum, sludge, and clear fluid from contaminated effluent is described. The device consists of the following components: a separator tank with a rotable shaft which extends axially for the entire height of the tank; an inlet pipe extending upwardly into the tank from the bottom thereof and having an effluent discharge opening for discharging contaminated effluent within the tank; a cylindrical housing disposed coaxially around the inlet; a circular splash plate located above the discharge opening and connected to the rotatable shaft; a circumferential channel defined by an outer side wall and an inner wall, with the bottom edge of the inner wall spaced upwardly from the bottom a distance greater than the maximum depth of sludge accumulation on the tank bottom so as to define a fluid discharge port for clean effluent; a skimmer means for sweeping floatable particles from the fluid surface; and a scraper blade for removing settled particles from the tank bottom. The circumferential edge of the splash plate defines several radially and downwardly directed ports for directing the flow of contaminated effluent impinging against the plate from the inlet discharge opening in an outward and downward direction into the tank at a level below the liquid surface. (Kreager-FIRL)
W77-00564

DOUBLE FUNNEL DEVICE FOR OXYGENATING SEWAGE,
Atara Corp., Montreal (Quebec). (Assignee).
J. W. Romanowski.
United States Patent 3,968,086. Issued July 6, 1976. Official Gazette of the United States Patent Office, Vol. 948, No. 1, p 261, July 1976. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Oxygenation, Equipment, *Design criteria, *Waste water treatment, Liquid wastes.

A patent for a device designed to oxygenate liquid sewage is described. The device consists of the following components: a means for supplying a pressurized oxygen-containing gas which includes an orifice for issuing a continuous stream of gas upwardly from below the top surface of the liquid sewage; a means for securing a first funnel at a location downstream from the orifice, with the upstream opening of the first funnel comprising a first inlet for entraining liquid sewage; a second funnel extending downstream from the downstream opening of the first funnel; a means to secure the second funnel in a predetermined relationship to the first funnel, with the upstream opening of the second funnel comprising a second inlet for intraining liquid sewage; an exit tube extending both upstream and downstream from the downstream opening of the second funnel, with an upstream opening in the exit tube which comprises a third inlet for liquid sewage entrainment; and a means for securing the exit tube to the gas supplying means. (Kreager-FIRL)
W77-00565

METHOD OF TREATING WASTE WATER,
Exxon Research and Engineering Co., Linden, N. J. (Assignee).
A. W. Liles, and R. D. Schwartz.
United States Patent 3,968,036. Issued July 6, 1976. Official Gazette of the United States Patent Office, Vol. 948, No. 1, p 248-249, July, 1976. 1 fig.

Descriptors: *Patents, *Biological treatment, *Waste water treatment, *Activated sludge, *Catalysis, Industrial wastes, Municipal wastes, Byproducts, Carbon, Organic compounds, Oxidation, Nucleation, Oxides, Metals.

A patent for a process which biologically treats industrial and municipal waste water containing organic carbon is described which utilizes a catalyst which has been deactivated in a fluid cracking process. The method involves mixing the waste water with an activated sludge at conditions which promote the biological oxidation of a portion of the organic carbon present in the waste water. These conditions include operation at a temperature between 10 and 60C and the separation of the effluent from the mixture of waste water and activated sludge. The novel aspect of the process involves the mixing of a catalyst with the activated sludge. The catalyst is one which has been deactivated in a fluid cracking process and comprises vanadium, iron, nickel, copper, and carbon supported on an inorganic oxide of alumina, silica, aluminum silicates, or mixtures thereof. The ration of the inorganic oxide, which acts as a nucleation center in the process, to activated sludge is anywhere from 0.1 to 10 weight %. (Kreager-FIRL)
W77-00566

PROCESS AND APPARATUS FOR TREATING WASTES BY A COMBINED ACTIVATED SLUDGE AND BIOLOGICAL FILTER BED,
J. Tymoszczuk.
United States Patent 3,968,034. Issued July 6, 1976. Official Gazette of the United States Patent Office, Vol. 948, No. 1, p 248, July, 1976. 1 fig.

Descriptors: *Patents, *Biological treatment, *Activated sludge, *Filtration, *Waste water treatment, Aeration, Sewage treatment, Recycling, Design criteria, Equipment.
Identifiers: *Biological filter beds.

A patent for a biological process and apparatus designed to treat waste water and sewage is described. The process involves the following steps: maintaining a submerged aerated biological filter bed zone in which finely divided particulate filtering media circulate; maintaining an aerated activated sludge zone in an upstream fluid zone; feeding waste to the activated sludge zone; recycling the waste from the activated zone through the biological filter bed and back to the activated sludge zone; maintaining a biological stable filter bed zone in downstream fluid flow relationship to the aerated biological filter bed zone and activated sludge zone so that the waste passes thereto; draining the treated waste from the biological stable filter bed zone; and backwashing the biological stable filer bed zone as often as required to maintain the operating effectiveness of the filter and an acceptable headloss at the treated effluent withdrawal point. (Kreager-FIRL)
W77-00567

EMULSION POLYMERIZATION OF CATIONIC MONOMERS,
Calgon Corp., Pittsburgh, Pa. (Assignee).
J. E. Morgan, and J. E. Boothe.
United States Patent 3,968,037. Issued July 6, 1976. Official Gazette of the United States Patent Office, Vol. 948, No. 1, p 249, July, 1976.

Descriptors: *Patents, *Sludge treatment, *Dewatering, *Filtration, *Polymers, *Emulsions, Surfactants, Waste water treatment, Chemical reactions, Solubility.

A patent for a process that releases water from activated sewage sludge is described. The process involves the following steps: addition to the sludge of between 0.1 and 20 ppm of a cationic polymer which is prepared by forming an aqueous solution of between 5-95% by weight of dimethl diallyl ammonium chloride and between 0.005 and 5 mole based on the moles of dimethyl diallyl ammonium chloride of a copolymerizable polyunsaturated cross-linking monomer selected from methylenebisacrylmide, methyl triallyl ammonium chloride, or tetraallyl ammonium chloride preparation of a water-in-oil emulsion of the aqueous solution in a water insoluble liquid containing a surfactant, with the water insoluble liquid being between 25 and 90% by weight of the total emulsion and the surfactant being 0.5% to 10% by weight of the total emulsion; heating the emulsion to a temperature sufficient to polymerize the monomers in the presence of a free radical polymerization initiator, with the free radical initiator being present in amounts varying from 0.0000001 to 0.1 mole/mole of dimethyl diallyl ammonium chloride; and filtering the sludge-polymer mixtre. (Kreager-FIRL)
W77-00568

SEWAGE SYSTEM WITH REUSABLE FLUID MEDIUM,
Chrysler Corp., Detroit, Mich. (Assignee).
R. W. Claunch, T. N. Deane, P. D. M. Rogan, C. M. Powe, and M. Werner.
United States Patent 3,974,528. Issued August 1976. Official Gazette of the United States Patent Office, Vol. 949, No. 3, p 866, August, 1976. 1 fig.

riptors: *Patents, *Sewage treatment, aration techniques, *Design criteria, lamation, Waste water treatment, Flow. ifiers: Flush mediums.

tent for a system that separates sewage waste a flush medium so that the medium can be d is described. The system consists of the fol- ig components: a non-aqueous liquid flush um with a specific gravity less than that of r; a separating tank for receiving and separat- he sewage waste and flush medium; a flush um outlet means positioned in the upper sec- of the separating tank; a first waste receiving connected to the lower waste containing sec- of the separating tank; and a waste outlet s positioned in the first waste receiving tank. two outlet means insure that the retained nes of waste are held at substantially constant s in both tanks. An intermediate interface in eparating tank established between the float- ush medium and the waste remains at a con- level below the flush medium outlet even g the receipt of additional flush medium and ge waste. (Kreager-FIRL)
00569

ARATUS FOR AEROBIC DECOMPOSI- OF SEWAGE,
Diggs.
d States Patent 3,966,604. Issued June 29, Official Gazette of the United States Patent e, Vol. 947, No. 5, p 2247, June, 1976. 1fig.

riptors: *Patents, *Sewage treatment, *Waste treatment, *Aerobic treatment, Flow, Aero- onditions, Equipment, Bubbles, Waste treat- , Liquid wastes.
ifiers: Aerobic decomposition.

tent for an apparatus that achieves aerobic, e-free decomposition of sewage and waste is described. The device consists of several ate liquid-containing compartments, a rotata- d horizontally disposed hollow drum at least lly immersed in the liquid contained in the f the compartments, a raw sewage feed pipe a discharge end located in the interior of the , and air inlet means at the bottom of the first artment, a bubble trapping means connected the drum, and a flow control means as- ed with the compartments to effect a ntial flow of material through all of the com- ents and the recycling of heavier particles. ge introduced into the drum contacts an ir- r inner surface of the drum sides for agita- Drum rotation is sufficient to cause particle entation and subsequent passage of smaller les through holes in the drum sides. At least of the bubbles produced by the air inlet contact fragmented particls, resulting in ion, aeration, and enhanced aerobic decom- on. (Kreager-FIRL)
00570

TING POLLUTED WATER.
alian Patent 471,335. Issued April 1976. Offi- urnal of Patents, Trade Marks and Designs, , No 13, p 1238, April, 1976.

iptors: *Patents, *Waste water treatment, ration techniques, *Coagulation, rption, Filtration, Bactericides, Suspended , Biochemical oxygen demand, Phosphorus, treatment.

nt for a process to treat polluted water such disposable mass of solids is produced along n effluent with a relatively low biochemical n demand, low suspended solids level, and osphorus content is described. The method es establishing a mixture of the polluted with four additives: a bactericidal agent, a al solids coagulating agent, a filter aid, and orbent. The aqueous medium has a solids e size resulting from recirculation between a polluted water accumulation zone and a zone adapted to effect coarse disintegration of any solids exceeding a predetermined particle size. The mixture of polluted water and additives is passed through a liquid and airtight liquid flow system under conditions to effect an intimate mixing of the additives and to maintain the solids in suspension. The liquid portion of the suspension is then separated from the solids for discharge as a substantially solids-free effluent. (Kreager-FIRL)
W77-00571

TREATMENT OF SEWAGE.
Australian Patent 472,563. Issued May 27, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 46, No. 18, p 1749, May, 1976.

Descriptors: *Patents, *Sewage treatment, *Separation techniques, *Disinfection, *Color, Chemical reactions, Recycling, Waste water treatment, Physical properties, Chemical properties.
Identifiers: Deodorization, Decolorization.

A patent for a method of treating sewage is described. The method involves the following steps: flushing the sewage with a flushing liquid from serveral receivers to form a mixture of liquid and sewage; separating the mixture into a portion containing a high level of solids and another portion containing a high level of liquid; separating the solid matter from the liquid with a high liquid content; maintaining a chemical composition in the liquid such that it acts as a disinfectant and deodorant; maintaining a bleaching action in the liquid to achieve a decolorizing effect; using the liquid as flushing liquid for the step; subjecting the high solids portion of the waste to mechanical particle size reduction; and holding the high solids portion of the waste in storage so that substantially all of the solid matter is exposed to the chemical content of the liquid and is thereby broken down, dispersed, sterilized, and deodorized. (Kreager-FIRL)
W77-00572

DECANTING WASTE WATER.
Australian Patent 472,574. Issued May 1976. Official Journal of Patents, Trade Marks and Designs, Vol 46, No 18, p 1752, May, 1976.

Descriptors: *Patents, *Waste water treatment, Flow characteristics, *Separation techniques, Sludge treatment, Currents(Water), Waste treatment, Liquid wastes, Biological treatment.

A patent for a method of treating waste water and any flocculating agents which may be required is described which involves passing the liquid upwardly over a sludge bed. The liquid is introduced periodically through and across the surface of the base of the sludge bed, with the treatment time being very short relative to the pauses which follow them. The liquid is removed from the above sludge bed after treatment. The method offers improved settling characteristics over prior art methods by directing the liquid through a preferential current imparting means in a direction of flow inclined to the horizontal. The preferential current imparting means extends upwardly in the sludge bed from its base surface, thereby resulting in enhanced sludge settling in the bed and the generation of preferential currents in the liquid and sludge. (Kreager-FIRL)
W77-00573

METHOD OF WASTEWATER TREATMENT,
Autotrol Corp., Milwaukee, Wis. (Assignee).
W. N. Torpey.
United States Patent 3,976,568. Issued August 24, 1976. Official Gazette of the United States Patent Office, Vol. 949. No. 4, p 1555, August, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Hydrogen sulfide, *Biological treatment, *Separation techniques, Organic compounds, Digestion, Waste treatment.

A patent for a method of treating waste water containing settleable organic solids and solublilized carbonaceous pollutants is described. Th method consists of the following steps: supplying the waste water to a treatment tank having upper and lower zones, settling the organic solids from the waste water in the upper zone, accumulating the settled solids in the lower zone, anerobically digesting the settled organic solids in the lower zone, and maintaining the waste water in the upper zone for a predetermined detention to produce a waste water effluent that is virtually free of dissolved or entrained hydrogen sulfide. (Kreager-FIRL)
W77-00574

PHOSPHORUS REMOVAL FROM WASTE WATER.
Australian Patent 473,137. Issued June 17, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 46, No. 21, p 2029-2030, June, 1976.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Aeration, *Phosphorus compounds, Sludge, Chemical precipitation, Recycling, Oxygenation.
Identifiers: *Phosporus removal.

A patent for a method designed to treat waste water containing biodegradable carbonaceous pollutants and phosphorus compounds is described. The method involves the following steps: introducing the waste water into a first aeration zone where it is mixed with a carbon-food consuming sludge and a phosporus-precipitating compound while being broutht into intimate contact with an oxygenating feed gas; recycling the sludge settled from the effluent liquor to the first aeration zone; passing the solids-sepleted liqid effluent into a second aeration zone where it is mixed with a carbonfood consuming sludge while being brought into intimate contact with a second oxygenating gas; and discharging the solids-depleted liqid effluent from the second aeration zone as product effluent water. The carbon-food consuming sludge in the second aeration zone consists at least in part of recycled sludge settled from the effluent liquor of the second aeration zone. (Kreager-FIRL)
W77-00575

METHOD FOR IMPROVING SEWAGE SLUDGE INCINERATION,
Nalco Chemical Co. Oak Brook, Ill. (Assignee).
For primary bibliographic entry see Field 5E.
W77-00576

APPARATUS FOR TREATMENT OF AQUEOUS SEWAGE COMPOSITION,
Heds, Inc., Chagrin Falls, Ohio. (Assignee).
T. C. Johnson, and J. D. Snodgrass.
United States Patent 3,975,256. Issued August 17, 1976. Official Gazette of the United States Patent Office, Vol. 949, No. 3, p 1105, August 1976. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Separation techniques, *Electrodes, Design criteria, Electrical equipment, *Waste water treatment, Electric currents, Equipment.

A patent for an apparatus capable of treating aqueous sewage without mechanical manipulation is described. The device consists of the following components: an enclosed chamber for receiving the aqueous sewage composition in its lower portion, thus defining an ullage space in its upper portion; a gas-tight valved inlet for the aqueous sewage which opens into the top of the ullage space; at least two electrodes of unlike polarity extending into a treatment space at the lower sewage-receiving portion of the chamber below the ullage space; a means for imposing on the electrodes a potential difference which is sufficient to effect an electrolytic discharge of gas at at least one of the electrodes as well as a current across the electrodes which is sufficient to cause an ebul-

lient rolling action which in turn causes the generation of a solids-containing head of lesser density above the aqueous sewage composition; and an outlet from the top of the ullage space which is connected through a conduit to a discharge end and allows for the outward passage of the solids-containing head. (Kreager-FIRL)
W77-00577

TREATING SEWAGE AND RECOVERING USABLE WATER AND SOLIDS,
B. J. Stralser.
United States Patent 3,975,247. Issued August 17, 1976. Official Gazette of the United States Patent Office, Vol. 949, No. 3, p 1102-1103, August 1976. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Separation techniques, Electrical equipment, *Reclamation, Electrodes, Design criteria, Chlorides, *Waste water treatment, Electric currents, Bacteria, Suspended solids.

A patent for a process and apparatus that treats sewage and recovers usable water and solids which are substantially free of live bacteria is described. The method involves the following steps: diluting the sewage with water to greater than 20 parts of water to one part solids (by weight); macerating the diluted material; passing the diluted macerated sewage upwardly through a screen thereby separating the non-suspended solids from the liquid; adjusting the chloride salt content of the sewage to between a minimum of 0.05% and a maximum of 3.5% (by weight); passing the screened sewage in a serpentine path progressively between a series of parallel electrodes; removing the evolved gases as the sewage progressively passes between the electrodes; and separating the liquid and suspended solids after the sewage passes between the electrodes. The electrical current flow between adjacent electrodes and through the sewage is between 0.25 and 1.0 amperes/sq in of electrode surface. (Kreager-FIRL)
W77-00578

HIGHLY ENERGY EFFICIENT-WILTON WASTEWATER TREATMENT PLANT,
D. A. Wilke, and D. R. Fuller.
Civil Engineering-ASCE, Vol. 46, No. 5, p 70-72, May 1976. 3 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Energy conversion, Economics, Gravity, Solar radiation, Construction, Materials, Concrete construction, Dewatering, Biological treatment, Disinfection, Stabilization, Design.

A highly efficient waste water treatment plant design that minimizes the need for offsite energy requirements is described. The design takes advantage of gravity flow to reduce pumping needs, solar energy to provide heat for the anaerobic digesters, and concrete construction to retain heat for the building itself. Waste water is lifted into the plant by screw pumps which use less energy than conventional pumps and flows through the rest of the plant by gravity. Pretreatment is provided by comminution and grit removal. Gross solids are removed by rotary screens. Secondary biological treatment is accomplished via a rotating biological contactor. Final solids separation is accomplished in clarifiers from which the solids are combined with the primary screenings and pumped to anaerobic digesters for stabilization before dewatering and disposal. Disinfectant for the effluent is generated on-site electrochemically from salt and water. First year energy cost savings are estimated to be $4700. (Kreager-FIRL)
W77-00579

INTERACTIONS BETWEEN SLUDGE CONDITIONING, VACUUM FILTRATION, AND INCINERATION,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
G. L. Christensen, W. R. Elliott, and W. K. Johnson.
Journal Water Pollution Control Federation, Vol. 48, No. 8, p 1955-1969, August 1976. 15 fig, 3 tab, 26 ref.

Descriptors: *Sludge treatment, *Chemical reactions, *Dewatering, *Filtration, *Incineration, Waste treatment, Analytical techniques, Lime, Iron compounds, Chlorides.
Identifiers: Ferric chloride, *Vacuum filtration.

Laboratory investigations of chemical sludge conditioning, vacuum filtration, and filter cake incineration were conducted. Neither lime nor ferric chloride alone was capable of producing a conditioned sludge suitable for vacuum filtration, even at doses as high as 30% on a dry solids basis. The most effective combination for chemical conditioning was 5% ferric chloride and 15% lime. Specific resistance measurements of sludge dewaterability exhibited considerable scatter, while capillary suction time measurements were quite precise. Nevertheless, specific resistance measurements reflected the improved sludge solids leaf yields associated with increases in ferric chloride and lime doses, whereas capillary suction time measurements did not. The water to sludge solids ratio was the utmost importance in assessing auxiliary fuel requirements for filter cake incineration. (Kreager-FIRL)
W77-00580

EVALUATION OF A SULFUR-THIOBACILLUS DENITRIFICANS NITRATE REMOVAL SYSTEM,
Agricultural Research Service, Beltsville, Md.
L. J. Sikora, and D. R. Keeney.
Journal of Environmental Quality, Vol. 5, No. 3, p 298-303, July-September, 1976. 6 fig, 3 tab, 32 ref.

Descriptors: *Denitrification, *Septic tanks, *Sewage treatment, *Domestic wastes, *Nitrates, *Biological treatment, Bacteria, Sulfates, Groundwater, Sulfur, Carbon, Inorganic compounds, Organic compounds, *Waste water treatment, Kinetics, Chemical reactions.
Identifiers: *Thiobacillus denitrificans.

A sulfur-Thiobacillus denitrificans nitrate removal system was evaluated as a means of denitrifying nitrified septic tank effluent. Duplicate 10 by 64 cm columns were filled with a 1/1 mixture (by weight) of elemental sulfur and dolomite chips and were pretreated by recycling an enrichment culture of Thiobacillus denitrificans ATCC 23642 through the columns for 3 days. Continuous passage of the nitrified septic tank effluent containing 40 micrograms of nitrate/milliliter through the columns resulted in nearly complete nitrate removal in 3.3 hours at steady state conditions. The denitrification kinetics appeared to be first order in the range of nitrate concentrations used. Sulfate was the major sulfur end product and was present at relatively high concentrations (90 micrograms/milliliter). Passage of column effluent through 10 by 60 cm Plainfield sand columns did not significantly decrease sulfate levels. A significant decrease in inorganic carbon content occurred with depth in the columns, but changes in organic carbon were insignificant. Although the use of this nitrate removal system appears promising, sulfate contamination of the groundwater may limit its applicability. (Kreager-FIRL)
W77-00581

RELATION OF OPERATION AND MAINTENANCE TO TREATMENT PLANT EFFICIENCY,
Environmental Protection Agency, Washington, D.C. Municipal Operations Branch.
W. G. Gilbert.
Journal Water Pollution Control Federation, V 48, No. 7, p 1822-1833, July, 1976. 5 fig, 9 tab, ref.

Descriptors: *Treatment facilities, *Waste wa treatment, *Operation and Maintenan *Efficiencies, *Operations, Federal governme Surveys, Municipal wastes, Progra Economics, Quality control.

Information from Environmental Protection Ag cy annual surveys on the efficiency of feder funded waste water treatment facilities presented. A major finding of the survey effo that about one-third of the nation's munic treatment facilities constructed with federal g assistance are not operating at their designed e ciency levels. The causes are many and varied depend on factors related to each specific tr ment facility. Areas where increased emphasi necessary to assist in improving the efficiency reliability of treatment facility performance clude: the strengthening of municipal operati programs at the local, state, and federal levels; development of expanded capabilities to pro technical operational assistance to munic facilities; the identification and satisfaction treatment facility operator needs; the impro ment of laboratory capabilities and testing grams to provide better process control infor tion; the provision of an adequate opera budget at the local level; and the developmen simplified and effective process control strate and methodologies. (Kreager-FIRL)
W77-00582

EFFECTS OF LIME ADDITION ON TRE MENT PLANT OPERATION,
URS Co., Seattle, Wash. Studies and Planning.
G. R. Minton, and D. A. Carlson.
Journal Water Pollution Control Federation, 48, No. 7, p 1697-1727, July, 1976. 12 fig, 13 tab ref.

Descriptors: *Lime, *Waste water treatm *Additives, *Influent streams, *Effluent strea Biological treatment, Chemical properties, Ph cal properties, Suspended solids, Oxygen dem Sludge, Solid wastes, *Treatment facili Operations.
Identifiers: Clarifiers.

The effect of using lime as a clarifying chemica the total operation of a waste water treatm facility is discussed. Lime addition to the waste water can be expected to result in a decr in suspended solids and oxygen demand in the mary effluent. A relatively clear effluent ca produced at insolubilization pH's of 9.5, 10, 1 and 11-11.5 in waste waters of high, moderate, low hardness and alkalinity, respectively coagulant aid will be required for low hardn low alkalinity waste waters and probably also waste water with moderate hardness and alka ty. The settling rate of the floc will incre benefiting hydraulically overloaded clarif Modification of the primary effluent will als fect the biological process. Lower organic load will occur, benefiting an organically overlo process; however, it is possible that too low a ganic loading will result in a deterioration of final effluent. Both the quantity and qualit solids and sludge will be significantly altere lime addition. If the system is operated within pH ranges identified above, solids will increas a factor of two to three. The quantity of sl may not increase correspondingly because o increase in the solids concentration. (Krea FIRL)
W77-00583

THE PERFORMANCE-POTENTIAL POLYELECTROLYTES AND HIGH VELOC GRADIENTS IN THE TREATMENT WASTEWATERS,
Ife Univ.(Nigeria). Dept. of Agricultural Engi ing.

Ogedengbe.
ffluent and Water Treatment Journal, Vol. 16, o. 6, p 289-292, June, 1976. 2 fig, 2 tab, 5 ref.

escriptors: *Sewage treatment, olyelectrolytes, *Coagulation, Sedimentation, edimentation rates, Biochemical oxygen demand, Suspended solids, Turbidity, *Waste water eatment, Treatment facilities, Feasibility studes, *Performance.
entifiers: Primary sedimentation.

e performance of polyelectrolytes in the coagution of sewage under varying conditions of locity gradients was investigated to assess the asibility of using such materials to obtain higher movals of suspended solids and biochemical oxen demand in primary sedimentation tanks. gh velocity gradients were found desirable up to out 500/sec when a domestic waste water was eated with cationic polyelectrolytes. An exnded period of rapid mixing was also found sirable up to about 25 minutes. Turbidity moval was improved when bentonite clay or alunum sulfate was used as a coagulant aid along th the polyelectrolyte. The results indicated that e management of existing domestic waste water eatment plants can be improved by the use of gh velocity gradients, an extended period of ear, and the addition of polyelectrolytes with me form of coagulant aid to the primary treatnt units. The total length of time required (30 nutes of rapid and slow mixing plus 20 minutes quiescent settling) is considerably less than the nventional detention time of about 2 hours comnly used in primary sedimentation. (Kreager-RL)
77-00584

OR NITRIFICATION - ONE SLUDGE OR VO,
own (P. E.) and Devlin Associates, Seneca, N.

G. Brown.
nerican City and County, Vol. 91, No. 7, p 49-, July, 1976. 1 tab.

escriptors: *Nitrification, *Activated sludge, ilot plants, *Efficiencies, *Nitrogen fixation, trogen fixing bacteria, *Waste water treatment, rformance, Evaluation, Temperature, Design teria, Treatment facilities.

pilot plant study comparing parallel systems of rbon oxidation and nitrification versus comed nitrification revealed no apparent difences in the efficiency and performance of one- d two-sludge nitrifying systems operated under same growth conditions at the same temperae. The pilot study was conducted at two temratures: 8 C and 20 C. The maximum growth es of nitrifying bacteria at these two temperaes were determined to be 0.25 days and 0.5 ys, respectively. Essentially complete nitrifican was attained at both temperatures at biologi- solids retention times of 20 days and 10 days, pectively. The results of the study indicated t nitrification in the activated sludge process be effectively controlled by application of the ncept of biological solids retention time and appriately determined sludge wasting policies. e results also indicated that the nitrification ocess should be selected on the basis of onomic and operating criteria rather than on ocess performance. (Kreager-FIRL)
7-00585

TOMATION IN SEWAGE PROCESSING,
mens A.G., Karlsruhe(West Germany). Measement and Process Engineering Div.
Michel.
mens Review, Vol. 43, No. 5, p 184-190, May, 6. 9 fig, 9 ref.

escriptors: *Treatment facilities, *Automation, onitoring, *Automatic control, *Sewage treatment, Chemical oxygen demand, Computers, Analytical techniques, Photometry, Design criteria, Equipment.

Automated instrumentation for the monitoring and control of sewage plant operations is discussed, with particular reference to a chemical oxygen demand measuring system and closed-loop control. The chemical oxygen demand measuring system requires an analysis time of about 25 minutes and can operate for 8-10 days without maintenance. Analysis takes place in a double-beam photometer with a reference beam of 750 nanometers and a measuring beam of 440 nanometers. The measuring ranges are: 0-100, 0-500, and 0-1000 milligrams of chemical oxygen demand/liter. A closed-loop control system is illustrated in which the oxygen supply is controlled by a reference variable expressing the amount of oxygen required for decomposition of the organic matter in aeration tanks. A photoelectric program transmitter can be connected to provide a reference variable expressing the daily oxygen load curves as empirical values. Advantages offered by the use of process computers in the control of sewage plant operations are also discussed. (Kreager-FIRL)
W77-00586

UTILIZATION OF ALUMIZED RED MUD SOLIDS FOR PHOSPHORUS REMOVAL,
Black, Crow and Eidsness, Inc., Gainesville, Fla. Process Design Dept.
E. E. Shannon, and K. I. Verghese.
Journal Water Pollution Control Federation, Vol. 48, No. 8, p 1948-1954, August, 1976. 3 fig, 4 tab, 6 ref.

Descriptors: *Water treatment, *Phosphorus, *Coagulation, *Pilot plants, *Feasibility studies, Costs, Biochemical oxygen demand, Suspended solids, Evaluation, Performance, Byproducts, Chemical precipitation, *Waste water treatment.
Identifiers: Alumized red mud.

The feasibility of using alumized red mud solids to precipitate phosphorus from water was investigated. Alumized red mud solids are the product obtained when red mud (a waste material formed during the production of alumina) is slurried with sulfuric acid followed by heat drying and crushing of the resulting solid product. Preliminary pilot plant studies revealed that the use of alumized red mud solids as a coagulant in fullscale phosphorus removal facilities is technically feasible. Practical dosage levels required to achieve a 1-milligram/liter total phosphorus level were around 200 milligrams/liter. Full-scale demonstration studies are planned to confirm the pilot plant results. Chemical cost savings on the order of 35% over traditional phosphorus removal systems are anticipated. Raw waste water biochemical oxygen demand and suspended solids removals obtained by the use of the alumized red mud solids at a dose of 200 milligrams/liter were comparable with removals obtained by alum at 200 milligram/liter and superior to those obtained by lime at 250 milligrams/liter. (Kreager-FIRL)
W77-00587

SODIUM ALUMINATE IMPROVES SLUDGE PROPERTIES,
Greene County Wastewater Treatment Plant, Ohio.
C. F. Lenhart.
American City and County, Vol. 91, No. 8, p 36-37, August, 1976.

Descriptors: *Waste water treatment, *Activated sludge, *Additives, *Physical properties, *Chemical properties, On-site investigations, Sludge digestion, Phosphorus, Biochemical oxygen demand, Suspended solids.
Identifiers: Sodium aluminate, Alum.

The use of sodium aluminate to improve sludge properties was evaluated during a 43-week study at an activated sludge waste water treatment plant. During the study, liquid sodium aluminate was added at a rate sufficient to produce a concentration of 10 milligrams/liter (as aluminum) in the sewage as it entered the aeration tanks. Three 4-week addition periods were separated by equal periods with no alum addition. The median sludge volume index during the aluminate treatment was 86 as compared with 146 during the non-treatment periods. Aluminate addition also resulted in increased floc density which kept the secondary clarifier sludge blanket in place, preventing washouts even during periods of severe hydraulic overload. The denser floc also proved helpful in sludge digestion. It became easy to form a separable supernatant that was low in biochemical oxygen demand and suspended solids and that could easily be withdrawn from the aerobic digestion tanks. Phosphorus removal during the treatment periods averaged 80% as compared with a normal 42% removal without aluminate. Residual benefits in the process continued for 10 days after aluminate feed was discontinued. Improvement was observed within 24 hours following the initiation of aluminate addition. (Kreager-FIRL)
W77-00588

SOFT WATER CAN MEAN HARD DISPOSAL PROBLEMS,
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
For primary bibliographic entry see Field 5E.
W77-00589

SINGLE-STAGE NITRIFICATION-DENITRIFICATION,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
D. F. Bishop, J. A. Heidman, and J. B. Stamberg.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 520-532, March, 1976. 5 fig, 8 tab, 15 ref.

Descriptors: *Nitrification, *Denitrification, *Activated sludge, *Waste water treatment, *Pilot plants, Biological treatment, Nitrogen, Dissolved oxygen, Design criteria, Efficiencies, Treatment facilities, Performance, Evaluation.
Identifiers: Bulking.

The removal of 75-84% of nitrogen from primary waste water has been achieved recently in a single-stage activated sludge (30,000-50,000 gallons/day) pilot plant without the use of supplemental organic carbon. The removal was achieved in a two-pass biological reactor in which the dissolved oxygen concentration was varied from 0 to 3 milligrams/liter. Air from a blower was applied on a 30-minute cycle, first to one reactor pass and then to the other. Mechanical mixers suspended the mixed liquor solids when the air was not applied to the pass. Nitrification occurred readily when the dissolved oxygen concentration was equal to or greater than 2 milligrams/liter; when the dissolved oxygen level was decreased to near zero, denitrification occurred. The chemical oxygen demand to total Kjeldahl nitrogen ratio in the waste water entering the reactor controlled the amount of nitrogen removal. A nitrogen removal of 84% was achieved in the summer at a ratio of 10:1; and during the winter, 75% of the total nitrogen based on the primary effluent was removed. Bulking problems limited winter operations and required low overflow rates (300 gallons/day/sq ft) to capture the solids in the clarifier. (Kreager-FIRL)
W77-00590

CARBON ADSORPTION OF AIR AND WATER POLLUTANTS,
For primary bibliographic entry see Field 5F.
W77-00591

DON'T WASTE WATERWEEDS,
National Space Technology Labs., Bay St. Louis, Miss.
B. Wolverton, and R. C. McDonald.
New Scientist, Vol 71, No 1013, p 318-320, August 12, 1976. 1 fig, 3 tab.

Descriptors: *Water hyacinth, *Waste water treatment, *Nutrients, *Heavy metals, *Organic compounds, Sewage treatment, *Biological treatment, Treatment facilities, Domestic wastes, Chemical wastes, Fertilizers, Byproducts, Methane, Mississippi, Lagoons.

Experiments conducted by the National Aeronautics and Space Administration indicate that water hyacinths (Eichhornia crasspipes) have the ability to absorb organics, heavy metals, nutrients, and other chemical elements from waste water under tropical and subtropical conditions while producing a large quantity of plant material. This water hyacinth biomass, when grown in sewage free of toxic metals, is a potential source of protein fertilizer, methane gas, and other valuable products. Currently, a water hyacinth chemical waste filtration system consisting of a zig-zag canal 330 meters long, 6.4 meters wide, and 0.8 meters deep is treating 95,000 liters/day of chemical and photo lab waste. On the basis of an analysis of raw sewage from small communities in South Mississippi, a half hectare lagoon covered with water hyacinths with a minimum sewage retention time of 2 weeks is estimated to be capable of purifying the daily wastes of 1000 people. An experimental water hyacinth lagoon has already reduced pollutant levels by 75-80%. (Kreager-FIRL)
W77-00592

ADVANCED TREATMENT AND PLANNED DEVELOPMENT CONTROL COUNTY'S POLLUTION,
K. Hotz.
Water and Sewage Works, Vol 123, No 8, p 74-76, August, 1976. 3 fig.

Descriptors: *Sewage treatment, *Sewerage, *Treatment facilities, *Biological treatment, Physical control, Adsorption, Activated carbon, Oxidation, Activated sludge, Regional development, Projects, *Tertiary treatment, Planning, Ohio.
Identifiers: Biophysical treatment, Medina County(Ohio).

Plans for a regional sewage collection and treatment system which include a biophysical waste water treatment facility using powdered activated carbon and wet air regeneration are described. The facility will be one of the first permanent applications of such a system in the United States. A development plan is also to be established so that population growth will be promoted where facilities already exist, thus avoiding random growth and making waste water treatment the determining factor in future residential and industrial development. The treatment facility will combine the physical adsorption and biological oxidation phases into a single treatment step, and the system will be incorporated within an existing single stage activated sludge system. The biophysical approach will make it possible for the treatment system to withstand shock loads which often limit the effectiveness of ordinary biological treatment methods. The need for costly disposal of excess activated sludge is eliminated because in the process of regenerating carbon by wet oxidation the accumulated biomass is destroyed. (Kreager-FIRL)
W77-00593

WASTE-TREATMENT PLANT POWERED BY ON-SITE ENERGY,
V. E. Smay.
Popular Science, Vol 209, No 3, p 97, 164, September, 1976. 1 fig.

Descriptors: *Treatment facilities, *Waste water treatment, *Solar radiation, *Methane, *Design criteria, *Energy conversion, Heat transfer, Construction, Concrete structures, Materials.

A waste treatment plant design for reducing off-site energy requirements is described. Except for a period from mid-December through February, solar energy and methane are expected to produce more than 90% of the heat required for the plant. A 1500-square-foot flat-plate, glass-covered hydronic solar collector will be the primary source of solar heat. This heat will go mainly to the anaerobic sludge digesters which operate most efficiently at 95 F. Excess solar heat will be used for space heating and domestic hot water. Methane which will be obtained from the sludge digesters as a byproduct will serve as a long-term storage medium for the solar energy. The plant will also recover 75% of the heat from the exhaust air in the vent system and all the heat from the electric (methane-fueled) generator. The building structure will be constructed of concrete blocks and bricks with insulation between. The roof is designed to retain snow for insulation value. Snow will also be used as a solar reflector. The project is due for completion by late 1977. (Kreager-FIRL)
W77-00594

DISINFECTION KINETICS OF ALGAL-BACTERIAL SYSTEMS,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
C. Venkobachar, I. C. Devkota, and D. S. Rana.
Indian Journal of Environmental Health, Vol 18, No 1, p 26-32, 1976. 3 fig, 2 tab, 10 ref.

Descriptors: *Disinfection, *Chlorine, *Oxidation lagoons, *Kinetics, *Coliforms, Bacteria, Algae, Organic compounds, *Waste water treatment, Laboratory investigations.

Laboratory investigations on the disinfection kinetics of algal-bacterial systems were conducted to investigate the feasibility of using oxidation pond effluents for the irrigation of edible crops. Residual chlorine curves indicated that chlorine consumption is a complex process in algal-bacterial systems and appears to be due to the oxidation of complex organic components, dead bacteria, and algal cells. Kinetic data indicated a deviation from Chick's Law, with the rate of disinfection being a function of the time of contact, disinfectant concentration, number of organisms exposed, and the temperature of the medium. The kinetics of chlorination did not follow a first order reaction. The maximum dose of chlorine employed (25 mg/liter) reduced the coliform count to 100/100 milliliters within 10-15 minutes. (Kreager-FIRL)
W77-00595

SIMPLE METHOD MEASURES SUSPENDED SOLIDS,
American Enka Co., Clemson, S.C.
For primary bibliographic entry see Field 5A.
W77-00596

EVALUATING POLLUTION-PRONE STRATA BENEATH SEWAGE LAGOONS,
B. Leisch.
Public Works, Vol. 107, No. 8, p 70-71, August, 1976. 2 fig.

Descriptors: *Sewage lagoons, *Lagoons, *Stratigraphy, *Sewage treatment, Hydrogeology, *Geologic mapping, *Groundwater, Seismic studies, Resistivity, Analytical techniques, *Waste water treatment.

The use of electrical resistivity and seismic techniques for evaluating pollution-prone strata beneath lagoons is discussed. Refraction seismic studies can determine the physical characteristics and thickness of the underlying geologic formations. Earth resistivity measurements can then be used to develop greater detail in terms of porosity and permeability of consolidated or unconsolidated formations. An example illustrating the application of the above techniques for evaluating a sewage lagoon site is presented. An analysis of the data obtained from seismic and resistivity measurements indicated that voids in sandstone or underlying dolomite had developed initially through the action of descending groundwater along joints and fissures. The study also revealed the need for upgrading lagoon seal specifications. (Kreager-FIRL)
W77-00599

CADMIUM ACCRUAL IN COMBINED WASTE WATER TREATMENT-AQUACULTURE SYSTEM,
Environmental Management Inst. Marion, Mass.
W. B. Kerfoot, and S. A. Jacobs.
Environmental Science and Technology, Vol. 10, No. 7, p 662-667, July, 1976. 8 fig, 2 tab, 22 ref.

Descriptors: *Aquiculture, *Sewage treatment, *Tertiary treatment, *Cadmium, *Algae, *Shellfish, Heavy metals, Toxicity, Phytoplankton, Sea water, *Waste water treatment, Liquid wastes, Metals.

Trace amounts of cadmium were added to isolate links of a sewage/seawater-plankton-shellfish food chain employed in a prototype tertiary treatment aquaculture system. Accumulation of the metal was studied in two types of phytoplankton, a green platymonad (Prasinocladus tricornutum) and a mixture of diatoms (predominantly Phaeodactylum tricornutum and Chaetoceros simplex), as well as in two species of shellfish, the American oyster (Crassostrea virginica) and the hard clam (Mercenaria mercenaria). The algae showed a rapid increase in metal concentration until an equilibrium was reached proportional to the initial concentration introduced. Shellfish species exhibited a continual increase in concentration when exposed to sea water and algae mixtures contaminated with cadmium. Separation of the two pathways of transfer identified the algae as the principal source of accumulation in the aquaculture system. A rate of cadmium increase amounting to 0.003 micrograms/day was computed to be sufficient to yield a critical concentration of the metal for 3-year-old shellfish. (Kreager-FIRL)
W77-00600

DESTRUCTION OF ALKALINITY IN AEROBIC BIOLOGICAL WASTEWATER TREATMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Civil Engineering.
J. H. Sherrard.
Journal Water Pollution Control Federation, Vol. 48, No. 7, p 1834-1839, July, 1976. 1 fig, 5 tab, ref.

Descriptors: *Nitrification, *Activated sludge, *Alkalinity, *Waste water treatment, *Mathematical models, Ammonia, Nitrogen, Nitrates, Nitrogen fixing bacteria, *Biological treatment, Biochemical oxygen demand, Phosphorus, Growth rates, Calcium carbonate, Chemical reactions, Aerobic treatment.

A mathematical model is used in conjunction with biochemical stoichiometric equations to describe alkalinity destruction which occurs in nitrifying activated sludge waste water treatment systems. The model results reveal that the commonly accepted value of 7.14 pounds of alkalinity as calcium carbonate destroyed/pound of ammonia nitrogen oxidized is in error. The error is primarily due to the incorporation of ammonia-nitrogen into the heterotrophic biomass. As a result, a small quantity of ammonia-nitrogen is available to be oxidized to nitrate-nitrogen. Primary factors affecting alkalinity destruction in nitrifying activated sludge systems are the influent waste water biochemical oxygen demand:nitrogen:phosphorus ratio and the net microorganism specific growth

An example problem is presented to illustrate mportance of these two factors in calculating inity destruction. (Kreager-FIRL)
-00606

ERSE OSMOSIS AS AN ADVANCED ATMENT PROCESS,
rio Ministry of the Environment, Thunder

Lim, and H. K. Johnston.
nal Water Pollution Control Federation, Vol. No. 7, p 1804-1821, July, 1976. 8 fig, 8 tab, 5

riptors: *Reverse osmosis, *Tertiary treat-, *Waste water treatment, *Nutrients, litives, Pilot plants, Efficiencies, Phosphates, nonia, Nitrates, Nitrites, Aluminum, Iron, ates, Calcium, Chlorides, Membranes, Foul-

h-scale and pilot plant studies of the effec-ess of reverse osmosis in removing nutrients residual chemical additives from waste water conducted. Reverse osmosis proved capable emoving nutrients from raw waste water, ndary waste water and non-waste water. phate removals approaching 100% were at-d. Ammonia removals averaged 85% and te and nitrite rejections of approximately 56% observed. Chemical additives conventionally as phosphorus precipitating agents were al-completely removed. Aluminum, iron, and te ion removals were above 97%; and calcium chloride removals were 92% and 83%, respec-y. During 4 months of operation, the removal iencies of all solutes studied remained almost tant. Variability in operating conditions ex-l little effect on membrane selectivity, ough permeate flux varied considerably. Sur-fouling was most pronounced for membranes exhibited lower rejection abilities. (Kreager-L)
-00607

ITRIFICATION OF WASTEWATER EF-ENTS WITH METHANE,
ois State Water Survey Urbana.
. Sollo, H. F. Mueller, and T. E. Larson.
nal Water Pollution Control Federation, Vol. No. 7, p 1840-1842, July, 1976.

riptors: *Denitrification, *Methane, *Waste r treatment, *Feasibility studies, *Kinetics, ogical treatment, Performance, Evaluation, nical reactions, Waste treatment, Bacteria, ates, Reduction(Chemical), Economics.

feasibility of using methane as a carbon ce for denitrifying waste water effluents was stigated. Columns packed with 0.32 to 1.27-imeter gravel were used as the reactors in of the experiments. The liquid level was tained at approximately one-half of the mn height, and methane was added to the r portion. The medium was recirculated nflow so that the liquid was able to dissolve ane from the atmosphere in the upper section re entering the lower flooded half of the mn. Identical systems with methanol as the cing agent were operated with nitrogen as the hase. Tests with parallel operations indicated the rate of nitrate reduction with methane as arbon source did not approach that observed methanol. With methane, the maximum rate ined was about 0.70 milligrams/hour/liter (as gen); whereas with methanol as the carbon ce, a rate of 4.6 milligrams/hour/liter (as gen) was obtained. Efforts to increase the rate trate reduction with methane using expanded mns failed, though such columns did increase itrate reduction rate when methanol was used e carbon source. In view of the low nitrate ction rate and problems involved in supplying lved methane to the denitrifying bacteria, trification with methane does not appear to be omical. (Kreager-FIRL)

W77-00609

WASTEWATER RECYCLING ALONG TRANSPORTATION CORRIDORS,
Black, Crow and Eidsness, Inc., Clearwater, Fla.
For primary bibliographic entry see Field 5G.
W77-00611

THE EFFECT OF DIGESTED SLUDGE ON SOIL BIOLOGICAL ACTIVITY,
Wyzsza Szkola Rolnicza, Wroclaw (Poland).
M. W. Varanka, Z. M. Zablocki, and T. D. Hinesly.
Journal Water Pollution Control Federation, Vol. 48, No. 7, p 1728-1740, July, 1976. 3 tab, 71 ref.

Descriptors: *Sludge, *Soil amendments, *Soil analysis, *Microenvironment, *Enzymes, Kinetics, Municipal wastes, Microbiology, Bacteria, Fungi, Actinomycetes.
Identifiers: Soil biological activity.

The effect of continuous heavy applications of digested municipal sludge to cropland on the main systematic groups of soil microflora and enzymatic activity was studied using soil samples from control and sludge-amended Blount silt loam soil. Anaerobically digested sludge was appled each year for 6 years to the amended soil, resulting in accumulative loading rates of 0, 92, 184, and 369 metric tons/hectare. No clear-cut restrictions in microbial populations and their activities were observed with the sludge-amended soil samples. Although total bacteria, fungi, and actinomycetes populations were never less in maximum sludge-treated plots, a significant increase in the populations for each of the major groups as a result of sludge application was recorded only once during three sampling dates. Percentage of denitrifiers, protease, and amylase activities were increased as a result of sludge application; while invertase and urease activities were unaffected by sludge treatment. Only the percentage of Azotobacter and cellulase activity were decreased by sludge treatment. (Kreager-FIRL)
W77-00612

WASTEWATER IRRIGATION - THE PRICE IS RIGHT,
Santa Rosa Public Works, Calif.
B. J. Riha, and R. L. Mills.
American City and County, Vol. 91, No. 3, p 55-57, March, 1976.

Descriptors: *Water reuse, *Reclamation, *Irrigation, *Waste water treatment, *Reclaimed water, Municipal wastes, Farms, Treatment facilities, Projects, Construction, Regional development, Biochemical oxygen demand, Suspended solids, Dairy industry, Coliforms, *California, Cities.
Identifiers: Santa Rosa(Calif).

A waste water reclamation program being developed by the city of Santa Rosa, California is described. The city has embarked on a full-scale waste water irrigation program by taking the entire discharge from its 6.5 million gallon/day West College Avenue treatment plant and distributing it to local dairy ranchers for the irrigation of about 1000 acres of pasture grass and feed crops. The city has also started construction on a major expansion of its Laguna waste water treatment plant; and when completed in early 1978, an additional 10 million gallons/day of effluent will be diverted to the land. The Laguna plant will also serve as a regional treatment facility for the entire Santa Rosa Plain. The regional reclamation plan will effectively achieve zero discharge of waste water to neighboring streams during the dry summer months. Effluent quality at the West College Avenue plant is high, with biochemical oxygen demand and suspended solids removal averaging 85%. The most probable number of coliform organisms does not exceed 2.2/milliliter. The plant diverts its effluent during about 6 months of the year to four holding basins spaced along a 6-mile gravity aqueduct which is bordered on both sides by dairy and beef cattle ranches. Standpipes along the route permit ranchers to tap the storage ponds for sprinkler or flood irrigation. (Kreager-FIRL)
W77-00613

LET'S CONSIDER LAND TREATMENT, NOT LAND DISPOSAL,
Cold Regions Research and Engineering Lab., Hanover, N. H.
A. Ulga.
Civil Engineering-ASCE, Vol. 46, No. 3, p 60-62, March, 1976.

Descriptors: *Waste water treatment, *Infiltration, *Water reuse, *Percolation, *Potable water, Economics, Nitrogen, Viruses, Pathogenic bacteria, Coliforms, Waste water disposal, Design criteria.
Identifiers: Land application.

The use of land application for the treatment of waste water is discussed in terms of pretreatment requirements, disinfection requirements, application rates, hydraulic considerations, and economics. An engineered land treatment system can produce high quality potable water using simple pretreatment and limits the problem of disposing of sludges. Virus, pathogenic bacteria, and coliforms are completely removed by percolation through a 5-foot depth of soil under controlled slow infiltration design conditions. Survival times are typically a maximum of 2-3 months for organisms retained on soil particles. The application rate of waste water is limited by the nitrogen uptake potential of the vegetative cover; however, once this limitation is satisfied, as much water as possible should be applied to minimize costs, assuming no other limitations exist. The cost of land treatment is lower than that associated with the use of septic tanks for both rural and suburban areas. (Kreager-FIRL)
W77-00614

WATER HYACINTHS FOR UPGRADING SEWAGE LAGOONS TO MEET ADVANCED WASTEWATER TREATMENT STANDARDS: PART I.
National Space Technology Labs., Bay St. Louis, Miss.
B. C. Wolverton, and R. C. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161, as N76-10697, $3.50 in paper copy, $3.00 in microfiche. Report NASA-TM-X-72729, October, 1975. 9 p, 2 tab, 12 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Biochemical oxygen demand, *Treatment facilities, *Water hyacinths, Sewage, Waste wate(Pollution), *Water quality standards.

Water hyacinths were studied as a means of accomplishing final filtration to remove nutrients, heavy metals, and other chemicals from domestic waste waters. Biweekly grab samples from before and after saturating a secondary domestic sewage lagoon were compared with samples from a control lagoon free of water hyacinths. The water hyacinth-covered lagoon had a surface area of 0.70 acre with a total capacity of 1.5 million gallons, receiving an inflow of 115,000 gallons per day from a 3.8 acre aerated primary sewage lagoon. Retention times varied between 14 and 21 days depending on the water hyacinth evapotranspiration rates. The water hyacinths functioned as an efficient and inexpensive final filtration system in a secondary domestic sewage lagoon during a three month test period. They reduced the suspended solids, biochemical oxygen demanding substances, and other chemical parameters to levels below the state standards. While absorbing organics, nutrients, and other chemical elements

from sewage waste, they produced large quantities of plant material. When grown in enriched sewage waste free of heavy metals, this biomass can be harvested and possibly processed into valuable feed products, organic fertilizer and soil conditioner, or methane gas and inorganic fertilizer. The volume of water hyacinths required depends on the amount of sewage to be processed and the desired purity of the final waste water. (Snyder-FIRL)
W77-00621

IMPROVED LIQUID-SOLIDS SEPARATION BY AN ALUMINUM COMPOUND IN ACTIVATED SLUDGE TREATMENT,
Nalco Chemical Co., Oak Brook, Ill.
C. F. Lenhart, and J. W. Cagle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 228, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-75-039, September, 1975. 71 p, 34 fig, 3 tab, 9 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Phosphorus, *Sludge digestion, Settling velocity, Chemicals, Sewage treatment, *Separation techniques.

A study was undertaken to determine the effects of sodium aluminate additions on the activated sludge waste treatment process. Data were compared for periods with and without chemical dosing. Waste water throughout the study was typical of the normal domestic sewage treated at the plant studied. The only attempts to adjust plant flow or treatment conditions were those necessary to maintain good, efficient waste water treatment operations. It was demonstrated that feeding liquid alkaline alumina to a 2.5 million gal per day activated sludge waste water treatment plant is a practical method of gaining several operational benefits. The increased sludge density permitted the plant to protect itself against solids washout during spot flows greater than 164% of designed plant capacity. Solids handling and ease of sludge volume index control were improved. Aluminate application allowed higher levels of mixed liquor suspended solids to be retained in the secondary clarifier. The improved solids removal with sodium aluminate reduced the loading on the tertiary treatment unit. Additional benefit was noted in the concentration of aerobically digested solids. Phosphorus removal approaching 80% was achieved with feed rates of 10 mg/liter as aluminum. The most efficient point to treat the mixed liquor stream was at the outlet of the primary basin. Residual benefits accrued for 10 days after aluminate feed was stopped. It took from 3 days to a week after starting the aluminate to produce optimum conditions in the secondary clarifier. Improved solids settling occurred within 24 hr of startup. Thicker return sludge resulting from the use of sodium aluminate permitted a substantial reduction in waste activated sludge volumes to be handled. (Snyder-FIRL)
W77-00622

DEMINERALIZATION OF WASTEWATER BY ELECTRODIALYSIS,
Environmental Protection Agency, San Francisco, Calif.
H. H. Takenaka, C. L. Chen, and R. P. Miele.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 102, $4.00 in paper copy, $3.00 in microfiche. Report EPA-600/2-75-047, October, 1975. 35 p, 6 fig, 9 tab.

Descriptors: *Waste water treatment, *Chemical oxygen demand, *Electrodialysis, *Treatment facilities, *Sewage, Effluents, Membranes, Cost analysis, Waste water(Pollution), Activated sludge, *Demineralization.

An electrodialysis pilot plant study was carried out to investigate the use of the process for waste waterdemineralization. The study was conducted using a 12 gpm electrodialysis pilot plant and the carbon-treated secondary effluent of the Pomona activated sludge plant. Stack fouling due to slime occurred whenever an increase in stack pressure was accompanied by a decrease in stack electric current or demineralization. This organic fouling significantly decreased the effectiveness of the process. An enzyme detergent was successful in removing most of the slime on the membranes, however, heavy slime formation in the stack was not removed. If the chemical oxygen demand (COD) of the feedwater remained at 10 mg/liter or less, a weekly enzyme detergent flush maintained the total dissolved solids (TDS) removal in the design range of 30-35%. An acid solution was required after the enzyme detergent flush to remove the detergent and restore the stack amperage. Other forms of fouling, such as membrane scale, were not as serious a problem. An acid solution effectively removed scale formation. The cost to produce water with 30 to 35% TDS reduction in a 10 MGD single stage electrodialysis plant was estimated at about $0.194 per 1,000 gallons of product water, not including the costs of carbon adsorption pretreatment and brine disposal. (Snyder-FIRL)
W77-00623

SELF-MONITORING PROCEDURES: BASIC LABORATORY SKILLS,
Charles County Community Coll., LaPlata, Md.
For primary bibliographic entry see Field 5A.
W77-00624

DEMONSTRATION OF A PLANNING PERSPECTIVE FOR WASTE WATER SLUDGE DISPOSITION KNOXVILLE/KNOX COUNTY,
Environmental Protection Agency, Washington, D.C., Water Planning Div.
D. Neptune, M. Wyatt, and R. Heil.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 936, $7.50 in paper copy, $3.00 in microfiche. Report EPA-440-9-76-001A, November, 1975. 177 p, 22 fig, 30 tab, 41 ref, 4 append.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, Analytical techniques, *Treatment facilities, *Planning, Sludge disposal, Sludge, Waste disposal, Disposal, Management, Project planning, Cost analysis, Reclamation, Industrial wastes, *Tennessee.
Identifiers: *Knoxville(Tenn).

The existing and future sludge disposal problem in Knoxville, Tennessee was investigated. The techniques employed in the projection of the present and future sludge quantities and qualities; selection of feasible sludge handling, transportation, and ultimate disposal or resource recovery methods; and the evaluation of these methods compiled into management plans were derived from a methodology previously developed by the Environmental Protection Agency. Six sludge management plans were found feasible for further consideration. They are sanitary landfill of a digested, dewatered sludge; trench-incorporation of a digested, dewatered sludge; incineration of an undigested, dewatered sludge from most treatment plants and sanitary landfill of a digested, dewatered sludge from two outlying plants; land application by spray irrigation of a digested sludge from most plants and landfill of a digested, dewatered sludge from an outlying plant; land application by composting and disking of a digested, dewatered sludge from most plants and landfill of a digested, dewatered sludge from an outlying plant; and producing fertilizer from digested sludge. None appear to present insurmountable problems in terms of meeting environmental constraints, performance criteria, or institutional and legal feasibility. However, the spray irrigation plan appears less cost-effective than the other five. (Snyder-FIRL)
W77-00626

INSPECTION MANUAL FOR THE ENFORC MENT OF NEW SOURCE PERFORMANC STANDARDS: SEWAGE SLUDGE INCINER TORS,
PEDCo-Environmental, Inc., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-00627

A PASSIVE FLOW MEASUREMENT SYSTE FOR STORM AND COMBINED SEWERS,
Grumann Aerospace Corp., Bethpage, N. Research Dept.
K. M. Foreman.
Report EPA-600/2-76-115, May, 1976. 137 p, fig, 1 tab, 6 ref.

Descriptors: *Sewerage, *Analytical techniqu *Flow measurement, *Acoustics, *Sewers, Flo meters, Design, Instrumentation, Electro equipment.
Identifiers: Experimental design, Acoustic sig tures, Sound level meters, Electroacoustic tra ducers.

A new, nonintrusive, low cost, passive flow m surement method to meet the urgent needs good management of storm and combined sew systems was investigated. The system is based sensing the near field sound emitted by disturbed flow at a channel discontinuity. Th local pressure pulses, called pseudosound, radi as dipole sound sources orthogonal to the fl direction. Flow rate is indicated by the outp signal of passive transducers, such as acceleron ters, attached to the outer wall of the chann after processing by a Fourier Analyzer. Labora ry tests using full scale sewer pipe elements an brief series of field tests measuring sanit sewage flow demonstrated its feasibility for ch nels where a discontinuity exists because of a c duit cross-sectional increase. The acoustic em sion has been found to produce unambiguo signals that increase in magnitude as the fluid fl rate increases. Low cost accelerometers havin wide range of voltage sensitivities, between 10 100 mv/g, were found to be well suited to acoustic monitoring function. Inexpensive but fective techniques to properly simulate sewer stallations were developed. The most relia unambiguous signal for flow rate measurement the acoustic emission component at a char teristic frequency, which is inversely proportio to the maximum geometric step at the discontin ty and directly proportional to the bulk sou speed of the fluid. Qualitative evaluation of t sound content from various and diverse rem sites can provide a mental image of local sew conditions that almost rivals in situ observati by a mobile crew, but with greater convenie and lower cost. Recommendations for further fi site testing using an instrumented sewer line made. (Snyder-FIRL)
W77-00628

WASTEWATER RECLAMATION PROJE ST. CROIX, U.S. VIRGIN ISLANDS,
Black, Crow and Eidsness, Inc. Gainesville, Fla
O. K. Buros.
Report EPA-600/2-76-134, June, 1976. 259 p, fig, 7 tab, 29 ref, append.

Descriptors: *Waste water treatment, *Biologi treatment, *Treatment facilities, *Waste tr ment, *Groundwater recharge, Reclamati Reclaimed water, Water reuse, Virgin.
Identifiers: Water reclamation, Waste water re mation, Artificial groundwater recharge.

A portion of the flow normally discharged to sea from St. Croix's primary treatment plant used for reclamation purposes. It was f processed in an advanced waste water treatm plant (AWWTP) by biological and physiochemi means. The treated waste water was conveyed a force main to recharge areas located about 1 mi away. Here it was stored in a holding tank

oduced into the groundwater aquifers by spray
gation and spreading basins. The project was
the purpose of improving the yield of wells and
sting in preventing further seawater intrusion
major well field. Background data on water
lity and quantity in the area was collected for 2
yr before recharging began. Recharging was
ied out for 8 mo. The best recharging method
ved to be with spreading basins in an alluvial
ey. The cost for treatment, recharging, and
overy was estimated at about $2.15/thousand
at 0.5 mgd, the rate used in the study. The pro-
demonstrated that it is possible to economi-
y augment the island's freshwater reserves
ugh using reclaimed waste water to artificially
harge groundwater. There was evidence of a
able increase in available groundwater in the
nity of the recharge activities. The major
blems included lack of sufficient waste water
treatment and recharge, mechanical failure of
tment equipment, and transfer to the central
tment plant of waste water containing a high
centage of sea water. Artificial groundwater
harge can only be accomplished successfully at
efully selected areas on St. Croix. The recharg-
activities did not significantly affect the water
lity of pumped wells. (Snyder-FIRL)
7-00630

MONSTRATION OF A PLANNING PER-
CTIVE FOR WASTE WATER SLUDGE
POSITION.
primary bibliographic entry see Field 5E.
7-00631

E LABORATORY EVALUATION OF A
THOD FOR ENHANCING THE KINETICS
ACTIVATED SLUDGE TREATMENT
ANTS,
uston Research, Inc., Tex.
. Sedita.
ilable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-245 683,
e codes: A04 in paper copy, A01 in microfiche.
ort EPA-600/2-75-061, October 1975. 72 p, 23
18 tab, 11 ref, append.

criptors: *Waste water treatment, *Activated
dge, *Sewage treatment, *Organic compounds,
zymes, Evaluation, Laboratory tests,
etics.
ntifiers: *Bacterial extracts.

activated sludge process was studied in the
oratory to determine the technical feasibility
disrupting a portion of the microbial cells in
return sludge will enhance the operating effi-
cy and capacity of municipal activated sludge
nts. Activated sludge from a Bellaire, Texas,
t was acclimated to five different test com-
nds: 2,4-dichlorophenol, linear alkylate sul-
ates, nitrilotriacetic acid, ethylene
trilotetraacetic acid, and ethylene glycol. The
compounds were then incorporated into waste
er influent and fed to the acclimated sludge
ch had been mechanically disrupted, to varying
rees, by sonic energy. Significant amounts of
uble materials were released from the concen-
ed sludge in the form of total organic carbon. A
nificant portion of the microorganisms found in
centrated sludge are killed by sonication. The
strate removal activity of disrupted sonicated
dge is not significantly different from un-
upted sludge having a thousand times the cell
centration, and the cell free supernate from
upted sludge may have substrate removal ac-
y up to 10 times that of normal sludge. It may
possible to significantly increase throughput
acity by using a combination of normal return
dge and disrupted sludge of supernate. (Snyder-
L)
7-00633

AVITY CLARIFIER,
. Jackson.

U.S. Patent No. 3,965,013, 6 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 4, p 1727, June 22, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, Gravity, Flow characteristics, Sludge, Sludge treatment, Settling basins, Equipment.
Identifiers: *Gravity clarifiers.

The type of gravity clarifier described is one in which the liquid flow patterns are derived from the energy of the influent liquid mixture which flows tangentially into the circular tank. The sludge is moved in toward the center of the base of the tank. The upward velocity of the flow of liquid toward the outlet provides a decreasing velocity of flow to the point where the velocity is low enough so that suspended solid matter can be released and by force of gravity carried to the bottom. A radial flow over a weir to an outlet trough is provided for the effluent clarified liquid. The apparatus consists of a cylindrical tank having a closed bottom with a downward depending truncated conical shell attached at its large end to the upper portion of the tank wall, with a peripherial trough near the top end of the tank and a weir for the overflow of effluent liquid into the trough. The influent conduit enters the tank tangentially and flows the raw mixture into the tank in the space between the outside of the inverted conical shell and the tank wall. The sludge is removed from the tank bottom near the center of the tank. (Sinha-OEIS)
W77-00690

TREATING WASTE DISCHARGE LIQUIDS FROM METAL HARDENING BATHS, PARTICULARLY CONTAINING NITRITE AND NITRATE COMPOUNDS,
E. Mohr.
U.S. Patent No. 3,966,508, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2216, June 29, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, Water pollution treatment, Water quality control, Evaporation, Condensation, Separation techniques, *Nitrates, *Nitrites.
Identifiers: *Nitrate-nitrite recovery, Cyanides, Hardening baths.

To improve recovery of nitrate-nitrite compounds from effluent of nitriding processes, a melt of the nitrate-nitrite salts is prepared and maintained at a temperature above about 400C. The effluent liquid is introduced into the melt, to evaporate the water and melt the salts contained in it. They merge immediately into the melt and the melt is drawn off by an overflow. The evaporated water is filtered to recover any remaining salts, together with condensation water. The apparatus includes a dispersion device close to the introduction duct of the effluent liquid to prevent introduction of the effluent liquid in a solid stream. This dispersion may be an open pot with a perforated bottom located beneath the surface of the melt, a cartridge with steel wool, or the like. The invention permits a continuous process without boiling over, or foaming. (Sinha-OEIS)
W77-00693

TREATMENT OF AQUEOUS WASTE SOLUTION,
Sumitomo Chemical Co. Ltd., Osaka (Japan). (Assignee).
M. Ohkawa, and Y. Sawaguir.
U.S. Patent No. 3,966,594, 7 p, 5 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2243-2244, June 29, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic wastes, *Water pollution treatment, Chemical oxygen demand, Chemical reactions, Separation techniques, Aqueous solutions, Anions.
Identifiers: Amine compounds.

The invention provides a process for treatment of organic waste water containing water-soluble organic anionic substances. An acidic waste water is contacted with a water-insoluble organic solvent solution of at least one amine. It was found that dibenzylalkylamines can satisfactorily be applied even though it is a mixture of various kinds of waste water or has a fairly high COD value because it has the ability to separate an aqueous layer from an oily layer. Separation into an aqueous and oily layers occurs very rapidly, and the oily layer containing organic anionic substances is separated from the aqueous layer and then subjected to the subsequent alkali back-extraction using an aqueous alkali solution. The continuous treatment is carried out by means of a mixer-settler process or countercurrent process. (Sinha-OEIS)
W77-00694

PROCESS FOR THE TREATMENT OF WASTE WATER FROM A FIBERGLASS MANUFACTURING PROCESS,
Amchem Products, Inc., Ambler, Pa. (Assignee).
T. N. Crowley, and D. M. Urbanski.
U.S. Patent No. 3,966,600, 6 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2245, June 29, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water pollution control, Water quality control, Chemical reactions, Flocculation, Separation techniques, Water reuse, *Dissolved solids, *Chemical oxygen demand.
Identifiers: Fiberglass manufacturing.

The invention provides a process for the treatment of waste water from a fiberglass manufacturing process to reduce chemical oxygen demand and also reduce the content of both dissolved and suspended solids. It enables the water to be reused in the industrial processes, so forming a closed cycle which is both more efficient and more economical. The steps are: acidifying the waste water to a pH of from about 2.5 to about 5.5 by the addition of a non-toxic inorganic acid; neutralizing the acidified water to a pH of from about 7 to about 9 by the addition of an nontoxic inorganic base, the base being capable of forming, with the inorganic acid added in the first step, an insoluble inorganic salt; adding a flocculating agent to the neutralized water to promote the separation of solid material from the treated water; and separating the solid material from the treated water. (Sinha-OEIS)
W77-00695

METHOD AND APPARATUS,
Ecodyne Corp., Lenexa, Kans. (Assignee).
C. E. Burkhead.
U.S. Patent No. 3,966,599, 7 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2245, June 29, 1976.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Water pollution treatment, Water purification, Aerobic treatment, Aerobic conditions, Equipment, *Aeration, Mixing, Biodegradation, *Microbial degradation.

Methods and apparatus are disclosed for treating biodegradable waste products. A liquor of waste products is introduced into a reactor mixing zone comprising a column of fixed media material having a high surface area to volume ratio, a low resistance to liquid flow and a surface condition receptive to aerobic microbial growth. The liquor is circulated in a continuous flow path including the fixed media column. A mechanical surface aerator is positioned in the continuous flow path immediately above the mixing zone to aerate the liquor and distribute it uniformly over the top of the fixed media column. The aeration, distribution and circulation of the liquor are accomplished in a manner to promote homogeneous mixing

throughout the mixing zone and to encourage aerobic microbial growth on the fixed media while minimizing agitation of a nature tending to dislodge the aerobic microbial growth and to develop flocculent aerobic microbes. A sediment receiving zone is provided immediately below an apertured floor of the mixing zone for collection of residual solids. (Sinha-OEIS)
W77-00696

EFFLUENT TREATMENT,
Robinson Brothers Ltd., West Bromwich (England). (Assignee).
A. Stevenson, and N. Harkness.
U. S. Patent No. 3,966,601, 5 p, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2246, June 29, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, *Water pollution treatment, Water pollution control, Water quality control, Chemical reactions, Separation techniques, Toxicity, Hydrogen ion concentration, *Chemical precipitation.
Identifiers: *Dithiocarbamates.

Dithiocarbamates are made on a considerable scale and widely used and thus they and related compounds tend to be present in some industrial effluents. They are used in making agricultural fungicides and in the rubber industry. It has been found that although dithiocarbamates are of low toxicity to mammals and birds, they are highly toxic to fish and have a significant and undesirable inhibiting action on the nitrification bacteria whose action is valuable in sewage treatment. Water-soluble dithiocarbamate is not biologically degraded in sewage treatment processes. A process is described for purifying industrial effluent containing dissolved dithiocarbamate by mixing the effluent at a pH of 6 to 8 with soluble heavy metal salt and thereby precipitating heavy metal dithiocarbamate. It is then separated from the effluent. It is essential that the pH of the effluent should be within the range mentioned and if not steps should be taken by addition of water-soluble basic or acidic compounds. (Sinha-OEIS)
W77-00697

LIQUID TREATMENT APPARATUS,
Ecodyne Corp., Lenexa, Kans. (Assignee).
D. G. Mason, and R. B. Higgins.
U.S. Patent No. 3,966,608, 6 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2249, June 29, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Domestic wastes, Septic tanks, Water quality control, Aeration, Anaerobic conditions, Microorganisms.

Because of the well known pollution problems that are generated by septic tank systems there is a need for a high-efficiency unit for the treatment of biodegradable wastes which is compact, inexpensive and can be used to provide treatment for single-family dwellings. This invention provides a method for treating such wastes. The liquor is delivered to a quiescent settling zone in which large particulates are permitted to settle to the bottom where they are subjected to digestion by anaerobic microorganisms. The liquor is then delivered to an aeration zone and then downward through a column of submerged fixed media. The fixed media is composed of a multiplicity of elements where are freely and randomly stacked on one another providing interstitial area between them. The elements have a high surface area to volume ratio, so that aerobic microorganisms can grow on their surface. As a result of their random stacking and high surface area, the elements promote homogeneous contact of the liquor with the fixed media. The liquor is received at the bottom of the fixed media and recirculated through the aeration zone and back through the fixed media in order to provide multiple passes through the media for thorough treatment. After such treatment the effluent ca be withdrawn from the unit. (Sinha-OEIS)
W77-00699

PACKED-BED REACTORS FOR NITRIFICATION AND DENITRIFICATION OF SECONDARY EFFLUENTS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. C. Young.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 607, Price codes: A08 in paper copy, A01 in microfiche. Completion report ISWRRI - 72, Iowa State Water Resources Research Institute Ames, June, 1976. 144 p, 45 fig, 15 tab, 33 ref. OWRT A-052-IA(1). 14-13-0001-4015, 5015.

Descriptors: *Nitrification, *Denitrification, Nitrogen, *Tertiary treatment, Filtration, Effluents, Pilot plants, Biological treatment, *Waste water treatment, *Suspended solids, *Biochemical oxygen demand.
Identifiers: *Packed-bed reactors.

Upflow packed-bed reactors (PBR) have been investigated to determine their usefulness as a tertiary treatment process to further reduce biochemical oxygen demand (BOD) and suspended solids (SS) from secondary effluents and to remove nitrogen by biological nitrification and denitrification. Laboratory-scale units were used to help identify system design parameters and to study the effect of such variables as temperature, detention time, oxygen concentration and packing material. Pilot-scale studies using secondary effluent were performed to help identify operating problems and to determine PBR performance in a more realistic treatment situation. These tests have shown that the PBR process can remove about 50% of the carbonaceous BOD and suspended solids from a secondary effluent. Another 20% to 30% can be removed by granular-media filtration. Biological nitrification could be achieved at flow rates below about 0.5 gpm/ft2 (1.25 m/h) and denitrification could be achieved at flow rates less than about 1.0 gpm/ft2 (2.5 m/h). Granular media such as crushed sand or coal or modular plastic media provided about equal performance, but were subject to plugging especially when using the PBR for denitrification. A complete tertiary treatment system consisting of packed-bed reactors for BOD removal, nitrification and denitrification and granular-media filters for final polishing can provide an effluent with BOD, SS and nitrogen concentrations comparable to that which can be achieved by physical-chemical treatment including activated carbon adsorption for removal of organic materials.
W77-00733

THE EFFLUENT TREATMENT PLANT OF BASF AG IN LUDWIGSHAFEN/RHINE,
Badische Anilin- und Soda-Fabrik A.G., Ludwigshafen am Rhein (West Germany).
H. J. Frost.
Centre Belge d'Etude et de Documentation des Eaux, Vol. 29, No. 390, p 221-228, May, 1976. 12 fig, 1 tab, 3 ref.

Descriptors: *Chemical industry, *Waste water treatment, *Treatment facilities, *Industrial wastes, *Activated sludge, Biological treatment, Separation techniques, Chemical wastes, Sludge treatment, Dewatering, Incineration, Liquid wastes, Solid wastes, Sewerage, Waste disposal.

The effluent treatment plant of BASF works in Ludwigshafen, the largest chemical complex in Europe, is described. Wastes from the chemical complex are segregated into contaminated and uncontaminated types and are handled by two separate drainage systems. Uncontaminated wastes which are used for cooling purposes are discharged into a system which also receiv sewage from the city of Ludwigshafen. Co taminated wastes are discharged separately f treatment at the effluent purification plant. Af neutrilazation and passage through a coarse b screen, contaminated wastes are then passed the treatment plant where they flow through fi screens and roughing tanks. The raw wastes a equally distributed in activated sludge units, a the mixed liquor flows through a secondary se mentation basin from which purified water discharged into the Rhine River. Settled sludge partly recycled into the activated sludge units. I cess sludge and primaary sludge from the rough tanks pass to a thickener unit and are dewatered filter presses after mixing with ash, lime, and i salts. The filter cake is burned in several fluid b incinerators. (Kreager-FIRL)
W77-00742

PURIFICATION OF INDUSTRIAL WAS WATER - HAVING HIGH CONCENTRATI OF DISSOLVED SOLIDS BY TREATME WITH STRONG ACIDS OR BASES TO GI FERTILISERS AND FEED ADDITIVES.
French Patent FR 2286-121. Issued May 28, 19
Derwent French Patents Abstracts, Vol. X, N 28, p D3, 1976.

Descriptors: *Patents, *Food processing indust *Waste water treatment, *Reclamati *Byproducts, Fertilizers, Additives, Feeds, Fil tion, Evaporation, Separation techniqu *Industrial wastes, Dissolved solids, Water pur cation.

A patent for an industrial waste water purificat method which yields fertilizers and feed additi as byproducts is described. The method invol the following steps: the automatic separation water with a high dissolved solids concentrat from water with a low dissolved solids concen tion; mixing the high dissolved solids fraction w strong acids or bases to obtain stable salts; fil tion to remove insoluble and precipitated s stances; concentration of the solution by evapo tion up to the saturation point with respect to least soluble salts; crystallization of the conc trated solution in one or more stages; and conse tive separation of mineral salts from the mot liquor which is rich in organic substances. T separated salts can be used as fertilizer or feed ditive, and the residual water may also be used feed additive. The process is particularly suit for waste water from food processing operati such as sugar refineries, distilleries, the ferme tion industry, and the starch and dextrin indus (Kreager-FIRL)
W77-00743

EFFECTS OF SELECTED IONS ON T REMOVAL OF CHROME (III) HYDROXIDE,
Notre Dame Univ., South Bend, Ind. Dept. Civil Engineering.
M. J. Thomas, and T. L. Theis.
Journal Water Pollution Control Federation, V 48, No. 8, p 2032-2045, August, 1976. 14 fig, 6 t 14 ref.

Descriptors: *Chromium, *Waste water tr ment, *Industrial wastes, *Chemical precipitati *Ions, Chemical wastes, Metals, Carbona Phosphates, Chemical reactions, Colloids, Coa lation.
Identifiers: Metal finishing industry.

The effects of anionic and metal ion impurities the removal of chromium wastes generated du metal finishing rinse operations are reviewed. removal technique considered involves the red tion of chromate-bearing waste to chromium (under acid conditions (pH of 3) followed precipitation of chromium (III) hydroxide un slightly alkaline conditions. The coagulation settling of colloidal chromium hydroxide shown to be a function of both the quantity

of impurity ions present. Troublesome ions as carbonates and phosphates which have origin in rinse baths should be kept egated from wastes containing chromium (VI). cond option to eliminate difficulties caused by onates and phosphates is to modify the treat- scheme for the combined waste. An example e use of lime instead of caustic soda for ralizing the waste after chemical reduction of mium (VI) to chromium (III) has occurred. use of lime will cause the precipitation and val of most of the carbonate and phosphate ies from solution while also providing doubly ged counterions to aid in the coagulation of negatively charged chromium hydroxide col- that exists at pH values of above 8. (Kreager-L.)
-00744

STEMS APPROACH TO THE ECONOMICS WASTE HANDLING,
n Univ., Birmingham (England). Dept. of nical Engineering.
. Bridgwater, S. A. Gregory, C. J. Mumford, E. L. Smith.
ource Recovery and Conservation, Vol. 1, No. 3-23, May, 1975. 3 fig, 5 tab, 58 ref.

criptors: *Oil industry, Economics, *Waste ment, *Waste disposal, *Reclamation, Cost- fit analysis, *Costs, Industrial wastes, cling, Transportation.

stems approach to the economics of treat- t, transport, disposal and recycling of wastes esented. Costs for each stage in the waste han- process are presented along with an introduc- to cost-benefit analysis. Total costs of alterna- ways of recycling, treating, or disposing of ific wastes are handled by summing relevant costs. Cost information provided is not in- ed to be exhaustive; rather, it is simply indica- of the availability of data and areas where ad- nal information is needed. The effects of new lation and changes in industrial material uction and usage patterns on the economics of e handling are also discussed. Examples of al- atives to waste disposal such as the burning of e lube oil for its heat content are suggested. ager-FIRL)
-00745

MOVAL AND RECOVERY OF CYANIDE ZINC FROM ELECTROPLATING STES BY SOLVENT EXTRACTION,
Ridge National Lab., Tenn.
. Moore, and W. S. Groenier.
ng and Surface Finishing, Vol. 63, No. 8, p 26- August, 1976. 1 fig, 4 tab, 12 ref.

criptors: *Zinc, *Metals, *Industrial wastes, clamation, *Waste water treatment, Chemical es, Water reuse, Solvent extractions, Separa- techniques, Feasibility studies.
tifiers: *Cyanides, *Electroplating industry es.

feasibility of using solvent extraction for the val and recovery of cyanide and zinc from roplating wastes was investigated in a labora- scale continuous mixer-settler. Quaternary es were used to extract the zinc and cyanide es, and regeneration of the amine solent for cle was achieved by stripping it with dilute m hydroxide. Free cyanide and zinc cyanide successfully removed, concentrated, and vered during 60 runs in which 100 liters of ac- rinse solutions from an industrial electroplater treated. The process yielded two useful ucts, the decontaminated water and a sodium oxide concentrate containing the recovered nicals. The extraction and stripping of cyanide zinc throughout the process were essentially titative. Amine losses to the aqueous raffinate aged in the 30-50 ppm range. (Kreager-FIRL)
-00747

BRILLIANT NON-CYANIDE ZINC PLATING.
Industrial Finishing, Vol. 52, No. 6, p 48-51, June, 1976.

Descriptors: *Industrial wastes, *Waste water treatment, *Zinc, *Electrochemistry, Nickel, Cadmium, Chemical precipitation, Settling basins, Sludge disposal, Dewatering, Waste treatment, Effluents, Chemical wastes.
Identifiers: Metal plating industry, Metal finishing industry, Zinc plating, Cyanide, Electro-plating.

A non-cyanide zinc plating system that minimizes cyanide contamination of plant effluent is described. The system employs Kenlevel II chloride zinc solution at a current density of 200 amperes/barrel and an operating voltage of 6.5-7 volts. Asarco high purity zinc ball anodes are used along with a Koroseal-lined dip tank. Rinse waters from zinc plating as well as nickel plating and black oxide treatment operations are routed to treatment, precipitation, and settling tanks. Chromate rinse and cadmium rinse containing any cyanide are treated at the point of use prior to being routed to precipitation and/or treatment reservoirs. Caustic soda which is added to the various rinse waters in the reservoirs precipitates the metals which are allowed to settle. Clear liquid which is adjusted to the proper pH is drawn off and allowed to seep into porous subsoil around the plant. Sludge is periodically drawn off or pumped out and dried for subsequent land fill disposal. (Kreager-FIRL)
W77-00748

FIGHT AGAINST POLLUTION AND NUISANCES IN THE FRENCH STEEL INDUSTRY (LUTTE CONTRE LES POLLUTIONS ET NUISANCES DANS LA SIDERURGIE FRANCAISE),
R. Chantereau, P. Geny, and J. Raguin.
La Technique Moderne, No. 6, p 70-75, June, 1976. 9 fig, 2 tab.

Descriptors: *Steel, *Industrial wastes, *Air pollution, *Waste water treatment, *Ammonia, Biological treatment, Acidic water, Neutralization, Flotation.
Identifiers: Hot dissociation.

Pollution control in the steel industries is reviewed. The ammonia contained in coke gases is absorbed by water which is then stripped, producing fumes which are incinerated and waste waters which are biologically treated. The agglomeration of minerals is a source of dust and smoke emissions; the dust is usually removed by electrofilters and has to remain under 150 mg/cu m at STP. Oxygen steel plants produce refinery gases (CO) and diffuse smoke. The gases can be collected without or with CO combustion; in the latter case, excess gas burners are used along with venturi scrubbers. Smoke is treated through a mixer unit which collects the smoke and removes dust and through a second unit which consists of three converters. Cold rolling waste waters go through a number of processes consisting of the neutralization of acid waters with calcium carbonate, the hot dissociation of oil-water emulsions, the de-oiling of the rolling waters by electroflotation, the continuous cold treatment of emulsions, and the treatment of electrolytic degreasing waters by air flotation. Waters thus treated will have a pH of 7.5, a total iron content under one mg/liter, and a sludge water content of 70%. (Takacs-FIRL)
W77-00749

PROCESS FOR GASIFYING CARBONACEOUS SOLIDS AND REMOVING TOXIC CONSTITUENTS FROM AQUEOUS EFFLUENTS,
Exxon Research and Engineering Co., Linden, N. J. (Assignee).
M. L. Gorbaty.
United States Patent 3,975,168. Issued August 17, 1976. Official Gazette of the United States Patent Office, Vol. 949, No. 3, p 1081-1082, August, 1976. 1 fig.

Descriptors: *Chemical wastes, *Sulfides, *Waste water treatment, *Air pollution, *Trace elements, Effluents, Industrial wastes, Hydrogen sulfide, Chemical precipitation, Separation techniques.
Identifiers: Gasification, Scrubber effluents.

A patent for a process which allows for the gasification of carbonaceous solids and the removal of toxic constituents from off-gas scrubber effluents is described. Carbonaceous feed material is reacted with steam to produce a raw product gas containing methane, hydrogen, carbon monoxide, carbon dioxide, and hydrogen sulfide. Heat is generated by the combustion of the carbonaceous solids to produce a raw flue gas having a lower hydrogen sulfide content than the raw product gas. This flue gas also contains toxic trace elements. The raw product gas is scrubbed with water to produce a product gas scrubber effluent containing hydrogen sulfide, and the raw flue gas is scrubbed with water to produce a flue gas scrubber effluent containing toxic trace elements. The two scrubber effluents are combined, and gases from the combined effluent are then stripped to produce an aqueous stripper effluent. Thereafter, precipitated trace element sulfides are removed from the aqueous stripper effluent. (Kreager-FIRL)
W77-00751

CHEMICAL CHARACTERISTICS AND ACUTE TOXICITY OF FOAM ON TWO AERATED LAGOONS,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Sweltzer Creek Salmon Research Lab.
For primary bibliographic entry see Field 5C.
W77-00752

WET AIR OXIDATION OF ALKALINE PULP LIQUORS.
Australian Patent 472,619. Issued May 27, 1976. Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 18, p 1763, May 27, 1976.

Descriptors: *Patents, *Pulp and paper industry, *Waste water treatment, *Chemical wastes, *Oxidation, *Evaporation, Incineration, Industrial wastes.

A patent for a process to treat alkaline pulping black liquor is described. The process involves subjecting the raw black liquor to wet air oxidation at a pressure between 500 and 1000 pounds/sq in and a temperature of between 220 and 280C. After substantial evaporation occurs, the residue is incinerated in a furnace. (Kreager-FIRL)
W77-00753

DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS,
British Columbia Research Council, Vancouver.
J. C. Mueller, and C. C. Walden.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 502-510, March, 1976. 3 fig, 4 tab, 15 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Lagoons, *Aeration, Biological treatment, Foam separation, Toxicity, Biochemical oxygen demand, Chemical wastes, Industrial wastes.
Identifiers: *Detoxification.

Removals of 5-day biochemical oxygen demand and toxicity from bleached kraft mill effluents were assessed for a 5-day retention aerated lagoon, a 24-hour extended activated sludge system, and a 6-hour retention activated sludge system operating under conventional and modified conditions. The 5-day lagoon, operating on direct feed but subject to upset during periods of nutrient deficiency and by remixing of scum, detoxified only 52% of the samples. In contrast, the same

lagoon operated with surge equalization under quiescent conditions and without remixing of scum detoxified 98% of the samples. The 24-hour system with poor mixing detoxified 85% of the samples and achieved a 94% detoxification success rate when operated with good mixing. The 6-hour system with direct feed and good mixing detoxified 68% of the samples. A modified 6-hour system in which pretreatment by foam fractionation preceded 6-hour retention activated sludge treatment detoxified 96% of the samples. All three systems operating under convention conditions aperiodically failed to detoxify effluents. (Kreager-FIRL)
W77-00754

ZINC REMOVAL FROM VISCOSE PLANT EFFLUENT - BY EXTRACTION WITH ALKYL PHOSPHORIC ACID INTO AN ORGANIC SOLVENT AND RE-EXTRACTION DECOMPOSITION THEREFROM.
South African Patent ZA 7406-710. Issued April 22, 1976. Derwent French Patents Abstracts, Vol. X, No. 26, p D1, May, 1976. 3 fig.

Descriptors: *Patents, *Solvent extractions, *Textiles, *Zinc, *Waste water treatment, Solubility, Metals, Chemical reactions, Industrial wastes, Chemical wastes, Liquid wastes.
Identifiers: Textile industry.

A patent for a process to remove zinc from aqueous solutions of viscose plant effluent is described. The process comprises a liquid-liquid extraction with a solution of a dialkyl phosphoric acid in an organic solvent such that the zinc and alkyl phosphoric acid form a compound which is more soluble in the organic solvent than in the aqueous solution. The organic solvent is then separated from the aqueous solution. The separated organic solvent is separated with an aqueous solution to split the compound formed and to redissolve the zinc in the aqueous solution The zinc-free organic solvent is then separated from the aqueous solution and returned to the extraction step. The dialkyl phosphoric acid is characterized by having alkyl constituents containing at least four carbons in straight branched cyclic alkyl, or phenyl configurations. (Kreager-FIRL)
W77-00756

ELIMINATION OF ZN FROM WASTEWATER OF RAYON PLANTS BY PRECIPITATION,
Akzo Research Labs., Arnhem (Netherlands).
H. C. DeJong.
Resource Recovery and Conservation, Vol. 1, No. 4, p 369-379, June, 1976. 4 fig, 4 tab, 10 ref.

Descriptors: *Textiles, *Zinc, *Reclamation, *Waste water treatment, *Chemical precipitation, Recycling, Industrial wastes, Chemical, Chemical wastes, Metals, Solubility, Treatment facilities.
Identifiers: Textile industry, Rayon plants.

The removal and recovery of zinc from rayon plant waste water by precipitation is discussed along with a commercial zinc removal process known as the fluidized layer system. The fluidized layer process is based on a two-step neutralization of the influent. In the first neutralization stage, impurities such as ferric ion, cellulose, sulfur, and zinc sulfide are removed. A precipitate of zinc hydroxide formed in the second step. The process allows for the reuse of zinc after formed zinc hydroxide sludge has been dissolved in sulfuric acid. Bench-scale application of the fluidized layer system to waste water from rayon plants yielded an effluent with a zinc content of 0.22 ppm. A theoretical discussion of factors affecting the solubility of zinc hydroxide is presented along with methods for the characterization of zinc hydroxide precipitate. (Kreager-FIRL)
W77-00757

LARGE-SCALE EFFLUENT TREATMENT IN THE DYESTUFFS INDUSTRY.
International Dyer and Textile Printer, Vol. 156, No. 2, p 79, 81, July 9, 1976.

Descriptors: *Textiles, *Dyes, *Waste water treatment, *Treatment facilities, *Municipal wastes, Flocculation, Sedimentation, Biological treatment, Aeration, Sludge, Incineration, Waste disposal, Industrial wastes, Dewatering.
Identifiers: Dyestuff industry, Textile industry.

A large-scale effluent treatment plant in the dyestuffs industry which also treats 14,000 cu m/day of municipal sewage from nearby communities is described. The treatment plant covers an area of about 30,000 sq m and comprises about 30 treatment stations grouped to form the following major plant sections: chemical/physical section, clarifying section, biological section, and sludge and waste incineration section. The effluent from the chemical works is pretreated in the chemical/physical section at a feed rate of up to 800 cu m/hour. This section comprises an acidic flocculation and flotation stage, an alkaline flocculation and sedimentation stage, and a buffer basin. Municipal sewage is pretreated in a mechanical clarifier and runs parallel to the industrial effluent treatment line. Biological sewage treatment occurs in four treatment lines for aeration, deaeration, and secondary settling. A total of 635 cu m of sludge settle out daily in the acidic and alkaline flocculation stage and in the biological treatment stage. This sludge is dewatered in a number of thickeners and is then burned in a fluidized bed furnace. (Kreager-FIRL)
W77-00758

RECLAIMING WATER,
V. Montgomery.
Modern Textiles, Vol. 57, No. 8, p 36, 38, August, 1976.

Descriptors: *Textiles, *Dyes, *Reclamation, *Water reuse, *Waste water treatment, *Reclaimed water, Automation, Recycling, Treatment facilities, Equipment, Economics, Filtration.
Identifiers: Textile industry.

A water reclamation system at a textile dyeing plant is described. The system recycles 1,900,000 gallons of water/day and can hold 80,000 gallons at one time. The entire operation is monitored from a master control panel that automatically sets the chlorine level for the water and determines correct pH. Two huge 20,000-gallon fiberglass tanks are fed by four smaller fiberglass working tanks of 10,000 gallons each where chemical treatment and filtration are used to clean the water. Dye is removed, and phosphate is retained. The entire treatment process requires only four minutes, with another five to six minutes being required to feed the four tanks. Due to the short time needed for dye water to pass through the system, the cleansed water re-enters the dyehouse at relatively high temperatures, thereby reducing fuel consumption and costs for heating dye water by as much as 45%. (Kreager-FIRL)
W77-00759

INFLUENCE OF SIZING AGENTS AND PRINTING THICKENERS ON BIO-CHEMICAL WATER PURIFICATION,
Scholten-Honig Research B. V., Foxhol (Netherlands).
P. J. A. Beersma.
Water and Waste Treatment, Vol. 19, No. 6, p 36, June, 1976. 1 tab.

Descriptors: *Textiles, *Waste water treatment, *Chemical oxygen demand, *Biochemical oxygen demand, *Water purification, Binders, Polymers, Oxidation, Oxygen demand, Alcohols, Organic compounds, Chemical wastes, Colloids, *Biological treatment.
Identifiers: Sodium alginate, Starch derivativ Polyvinyl alcohols, Polyacrylates, Synth polymers, Thickeners, Textile industry.

The influence of colloidal substances which used in textile sizing (binding agents) and prin (thickeners) on the purification of effluent wat discussed. For the total oxidation (chemical ygen demand) of most starch derivatives, 110 milligrams of oxygen per 100 milligrams of product are required. The same applied to der tives of cellulose and guar gum. Synth products such as polyvinyl alcohol and polya lates require more oxygen for complete oxidat Sodium alginate compounds require relatively tle oxygen in comparison with the above c pounds. A comparison of the 5-day biochem oxygen demand values of various binding ag and thickener reveals that natural products wi degrade easily have much higher biochemical ygen demand values than synthetic polym (Kreager-FIRL)
W77-00760

REMOVING IRON FROM ACID WA LIQUIDS BY OXIDATION - AT CONTRÒL PH BY ADDITION OF BASE, GIVING EAS SEPARATED PRECIPITATION FOR LAR SCALE USE.
French Patent FR 2284-568. Issued May 14, 1 Derwent French Patents Abstracts, Vol. X, 26, p D2, April 9, 1976.

Descriptors: *Patents, *Iron compounds, *W water treatment, *Oxidation, *Chemical preci tion, Industrial wastes, Chemical wastes, Fi tion, Separation techniques, Acids, Ions, Oxid
Identifiers: Metals industries.

A patent for a method to remove iron from wastes generated during the etching of iron p cles or during the production of titanium dioxi described. The process involves the oxidatio acid waste liquids containing ferrous ions at a perature of 50-75C and a pH between 3.5-5. the addition of a base which results in the fo tion of a precipitate containing multicrystal glomerated particles of an iron compound. base claimed in the present patent is amm although other bases such as hydroxides of p sium, magnesium, or calcium may be used. precipitate is filtered off, giving a clear, al neutral liquid. The large iron-containing part are removed as iron oxide and iron peroxide b tration; the ferromagnetic iron oxide may Alt tively be separated in a magnetic field. The o tion is caused by blowing air into the waste li and ammonia is added to the air stream. The o tion is continued until the pH suddenly ris about 7. (Kreager-FIRL)
W77-00761

QUATERNARY AMMONIUM SALTS TROL ODORS,
For primary bibliographic entry see Field 5G.
W77-00762

WHY INDUSTRIAL WASTEWA PRETREATMENT,
W. M. Throop.
Industrial Wastes, Vol. 22, No. 4, p July/August, 1976.

Descriptors: *Chemical wastes, *Indu wastes, *Sewerage, *Legislation, *Mun wastes, Permits, Cities, Waste water treat Federal Water Pollution Control Act, Biochemical oxygen demand, Suspended s Loans, Federal government, Local governm Standards, Toxicity.

Requirements of the Federal Water Pollution trol Act Amendments of 1972, Public Law 92 regarding the pretreatment of industrial wast troduced into municipal systems are revi

pretreatment sections of the Act are intended revent the introduction of pollutants which in- re with, pass through, or are otherwise incom- le with the treatment of liquid wastes in mu- al treatment plants. Under the law, a mu- ality must obtain a permit under the National tion Discharge Elimination System, and no ent for which a permit has been issued may ed the effluent standards and limitations set in the permit. User charges, as assessed r Section 204 (b) of Public Law 92-500, are rally graduated on the basis of flow, hemical oxygen demand, and suspended s of liquid wastes. Substances which are lly excluded from municipal systems are e which restrict hydraulic capacity, cause nical or mechanical erosion of the sewerage m, endanger public health, or produce condi- obnoxious to the public interest. The En- nmental Protection Agency has published a list oxic materials which will be limited or ex- ed from industrial waste discharges to mu- al systems. The Agency has also instituted a program for small businesses needing capital neet water pollution control requirements. ager-FIRL)
-00763

LUENT TREATMENT IN THE PAINT AND FACE COATING MANUFACTURING IN- TRY,
. Hemming.
t Manufacture, Vol. 46, No. 6, p 8-13, 29, , 1976. 2 fig, 1 tab.

criptors: *Chemical industry, *Waste water tment, *Paint, *Industrial wastes, *Sludge tment, Effluents, Biochemical oxygen de- d, Chemical oxygen demand, Suspended ds, Metals, Flocculation, Biological treatment, ration, Sedimentation, Coagulation, Flotation, mical wastes.
ntifiers: Paint manufacturing industry.

uents generated by paint manufacturing plants described along with methods for their treat- t. Typical values for effluent chemical oxygen and, biochemical oxygen demand, suspended ds, chromium, zinc, lead, antimony, tin, and are: 6200, 4200, 700-2000, 0.2, 6.0, 3.0, 5.0, , and 20 milligrams/liter, respectively. Treat- t options for purifying paint manufacturer ef- nts include: coagulation, flocculation, sedi- ntation, flotation, microflotation, and biologi- treatment (activated sludge or biological filtra-). The use of chemical flocculation and sedi- ntation or flotation can be expected to remove ut 80% of the suspended solids and about 50% he biochemical oxygen demand and chemical gen demand in mixed effluent from paint nufacturing operations. Additional purification uired for discharge to a water course is accom- hed by biological treatment. The resulting ge generated from effluent treatment generally a solids content in the range of 1-3% and can oncentrated up to about 25% (by weight) using hanical dewatering. (Kreager-FIRL)
7-00764

APORATION AND THERMAL OXIDATION LIQUID EFFLUENTS - BY BURNING WITH AME IN COMBUSTION CHAMBER.
gian Patent BE-838-608. Issued June 16, 1976. went Belgian Patents Abstracts, Vol. X, No. p D2, 1976.

criptors: *Patents, *Chemical wastes, *Waste er treatment, *Evaporation, *Incineration, In- trial wastes, *Oxidation, Liquid wastes, Solid tes, Equipment, Design criteria, Chemical in- try, Toxicity.
ntifiers: Thermal oxidation.

patent for a process designed to achieve poration and thermal oxidation of liquid ef- nts containing toxic products generated from industrial operations such as refineries, paper mills, color manufacturers, and petrochemical plants is described. The apparatus used for continuous evaporation and thermal oxidation of the wastes includes a central conduit for conveying effluent which is sprayed at an outlet to produce a liquid jet, an annular conduit surrounding the central conduit which is fed with a fuel gas and is pierced with orifices which open into a pipe surrounding the annular conduit, and a turbine which causes combustion air to rotate by its own kinetic energy before reaching the fuel. The resulting flame has a divergent shape and is spatially distinct from the liquid jet. The flame vaporizes the effluent by convection currents in the combustion chamber. In addition to treating the products in the liquid effluent, the apparatus can also be used to burn solid wastes as a result of their admixture with the fuel. A stable flame can be obtained by making use of the blown secondary air employed for spraying the effluent. (Kreager-FIRL)
W77-00765

OPTIMIZE THE EFFLUENT SYSTEM - PART 5: MULTI-MEDIA FILTERS,
J. F. Grutsch, and R. C. Mallatt.
Hydrocarbon Processing, Vol. 55, No. 7, p 113-118, July, 1976. 8 fig, 5 tab, 2 ref.

Descriptors: *Filtration, *Waste water treatment, *Oil industry, *Effluents, *Separation techniques, Suspended solids, Activated sludge, Lagoons, Aeration, Biological treatment, Industrial wastes, *Filters.
Identifiers: Mulit-media filters.

The use of multi-media filtration for the treatment of refinery effluents is discussed. Topics discussed include: filtration mechanisms, chemical pretreatment for direct filtration, refinery make-up water clarification, filtration of API separator effluents, filtration of aerated lagoon effluents, filter unloading, and filter failure. Direct filtration for phase separation is cited as a key element in end-of-the-pipe treatment sequences for the removal of suspended matter to levels that permit optimization of activated sludge processes. Determining the proper chemical pretreatment to destabilize suspended matter prior to filration is the key to sucess in applying filtration. Direct filtration is also applicable to intake water, effluents from secondary treatment, and essentially all phase separation problems if destabilization chemistry is addressed. (Kreager-FIRL)
W77-00766

PRECIPITATION OF PHOSPHATE FROM SOLUTION USING ALUMINUM SALT,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.
P. H. Hsu.
Water Research, Vol. 9, No. 12, p 1155-1161, December 1975. 8 fig, 5 tab, 1 equ, 18 ref. OWRT A-042-NJ(1).

Descriptors: *Phosphates, *Chemical precipitation, Water quality, *Waste water treatment, Salts, Hydrogen ion concentration.
Identifiers: *Aluminum salts.

In the absence of any interfering component, the optimum pH range and the effectiveness of aluminum phosphate precipitation were found to vary with the initial ratio of phosphate to aluminum in sample preparation. Phosphate was almost completely removed from solution when aluminum was in large excess. At maximum, 1 mole of phosphate was precipitated by 1 mole of aluminum, but this occurred only when phosphate was in large excess. (Skogerboe-Colo St)
W77-00871

REMOVAL OF ORGANICS FROM WATER,
Permutit-Boby, Ltd., London (England).
M. C. Rowe.
Effluent and Water Treatment Journal, Vol. 6, No. 47, p. 519-522, 1975. 5 fig., 2 tab., 4 ref.

Descriptors: *Waste water treatment, *Water softening, *Organic wastes, *Resins, *Ion exchange, Cellulose, Fouling, Humic acids, Adsorption, Byproducts, Organic acids, Phenols, Industrial water, *Industrial wastes.
Identifiers: Viscose resins, Polystyrene resins, Acrylic resins.

A weak base macroporous viscose (regenerated cellulose) exchanger which was hydrophilic and reduced 'fouling' caused by irreversible adsorption of humic acids was compared with a strong base polystyrene macroporous resin and a weak base acrylic 'gel' resin. Its adsorption and desorption efficiencies were higher. Viscose resins could, by running ahead of the polystyrene resins, reduce the organic load induced during high runoff. Use of the two resins in series would save space and labor, could be automated, would not be susceptible to high organic breakthrough, and would reduce humic acids more. With acidic brewery condensates, high molecular weight acids slipped the polystyrene resin. Acrylic resins adsorbed low molecular weight organic acids better. Viscose resins adsorbed slippage from the polystyrene resin; they had a high capacity for proteins and high molecular weight organic acids and gave better desorption of large organic acids. Polystyrene resin capacity was lowered with increasing molecular weights; some neutral phenolic materials were adsorbed. This method permits removal of organic material from water and process streams over the whole molecular weight range. The regenerant can be evaporated and the ammonium salts of the organic acids crystallised and recovered. The ammonia driven off in the evaporation can be trapped and reused, and the ammonium acid salts used as an animal feed supplement. (Buchanan-Davidson--Wisconsin)
W77-00924

MUNICIPAL PHOSPHORUS LOADINGS TO LAKE ERIE, AN EVALUATION STUDY PREPARED FOR THE GREAT LAKES WATER QUALITY BOARD.
International Joint Commission-United States and Canada, Windsor (Ontario). Great Lakes Water Quality Board.
For primary bibliographic entry see Field 5B.
W77-00926

WATER POLLUTION INVESTIGATION: BLACK RIVER OF NEW YORK.
Hydroscience, Inc., Westwood, N. J.
For primary bibliographic entry see Field 5B.
W77-00929

DETOXIFYING INDUSTRIAL WASTEWATERS.
Environmental Science and Technology, Vol 10, No 2, p 127-29, Feb 1976. 3 p, 1 map, 3 photo, 1 chart.

Descriptors: *Toxins, *Water pollution control, *Treatment facilities, *Industrial wastes, *Water pollution treatment, Water pollution sources, Water policy, Monitoring, Water resources, Treatment, Pollutants, Waste treatment, Water treatment, Sewage treatment, Chemical wastes, Oil wastes, Sludge, *Waste water treatment.

Systematic toxic waste disposal has become an increasing problem in recent years. Because of treatment complexity, troublesome sequestering, and cost factors, many industrialized firms are not in a position to build detoxification plants that meet anti-pollution requirements. Regional treatment centers offer a solution to this problem. These centers accept almost all inorganic materials and solutions. Such materials are delivered in plastic cylinders to the center where they are transferred to large storage tanks. The storage tanks are divided into eleven sections which are classified as to the

materials received. The solutions then undergo several chemical processes that are described in detail. Some of the processes include reprecipitation, decontamination of cyanide, and ion-exchanger regeneration. The treatment charges for this process, which are fixed by the center's board of directors, are considerably cheaper than individual treatment. If these centers are fully utilized, water pollution by toxic solutions can be considerably abated since companies will no longer have to dump the solutions into streams. (Hoffman-Florida)
W77-00965

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-00986

5E. Ultimate Disposal Of Wastes

DEFUSING THE SEWAGE STINKBOMB ON THE TYNE.
For primary bibliographic entry see Field 5D.
W77-00559

METHOD FOR IMPROVING SEWAGE SLUDGE INCINERATION,
Nalco Chemical Co. Oak Brook, Ill. (Assignee).
G. Flynn.
United States Patent 3,974,783. Issued August 17, 1976. Official Gazette of the United States Patent Office, Vol. 949, No. 3, p 951, August 1976.

Descriptors: *Patents, *Sewage sludge, *Sludge treatment, *Sludge disposal, *Incineration, Temperature, Magnesium compounds, Metals, Waste treatment, Solid wastes, Carbon, Burning.
Identifiers: Combustion.

A patent for a method that improves sewage sludge incineration by lowering the ignition temperature of carbon is described. The method involves burning the sewage sludge in the presence of between 50-8000 ppm by weight (based on dry sewage sludge) of an additive consisting of a metal compound and a magnesium compound. The metal compound may contain copper, cobalt, manganese, iron, or calcium. The magnesium compound may be either magnesium oxide or any magnesium compound which decomposes to magnesium oxide under combustion conditions. The weight ratio of the magnesium compound (expressed as Mg) to the metal compound (expressed as said metal) is between the range of 5:1 to 35:1. (Kreager-FIRL)
W77-00576

INTERACTIONS BETWEEN SLUDGE CONDITIONING, VACUUM FILTRATION, AND INCINERATION,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5D.
W77-00580

SOFT WATER CAN MEAN HARD DISPOSAL PROBLEMS,
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
H. F. Zinsmeister, and J. N. Ramaswamy.
American City and County, Vol. 91, No. 8, p 47-48, August, 1976. 2 fig, 2 tab.

Descriptors: *Zeolites, *Water softening, *Waste disposal, *Waste treatment, *Brine disposal, Chlorides, Sodium compounds, Calcium compounds, Magnesium compounds, Reverse osmosis, Electrodialysis, Lagoons, Recycling, Water treatment, Costs.
Identifiers: Holding tanks.

Problems associated with the disposal of brine wastes generated by zeolite softening units are discussed. These wastes contain chloride ions (principally from sodium, calcium, and magnesium compounds) proportional to the amount of salt used in the regeneration of the zeolite. Disposal techniques usually focus on keeping these brines out of local streams since high concentrations of the chlorides formed during the regeneration process can be harmful to both aquatic life and livestock. If limiting values for the constitutents of zeolite wastes are known for a given stream, the flow necessary to dilute the wastes may be estimated. Volume reduction of the brine waste by utilizing the regenerative capacity of the brine is a good treatment method. By returning brine normally exhausted during the regeneration cycle to the brine storage tank, the discharge and treatment of the waste can be reduced by about two-thirds. Estimated waste disposal costs are tabulated for the following treatment methods discussed: reverse osmosis, electrodialysis, lagoon (annual discharge), holding tank with steady discharge, and holding tank (20 years). (Kreager-FIRL)
W77-00589

IRRIGATION OF CORN WITH SIMULATED MUNICIPAL SEWAGE EFFLUENT,
Michigan State Univ., East Lansing. Agricultural Experiment Station; and Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
D. L. Karlen, M. L. Vitosh, and R. J. Kunze.
Journal of Environmental Quality, Vol. 5, No. 3, p 269-273, July-September, 1976. 4 fig, 6 tab, 25 ref.

Descriptors: *Irrigation effects, *Municipal wastes, *Sewage disposal, *Nutrient removal, Nitrogen, Potassium, Sodium, Plant growth, *Corn(Field), Laom, Denitrification.

A field study designed to evaluate the effects of applying 25, 50, 100, and 200 cm of simulated municipal sewage effluent to corn grown on a tile-drained loam soil was conducted. The results indicated that if effluents which are low in potassium and high in sodium are to be renovated through land disposal supplemental potassium must be applied. The experiment also demonstrated that the annual loading rate on a tile-drained Conover loam should not exceed 100 cm of supplemental effluent if efficient utilization of the applied nutrients through plant uptake is to be achieved. Nitrogen recovery through plant uptake at the 25-, 50-, and 100-centimeter loading rates exceeded 40% of the nitrogen applied through effluent and starter fertilizer when the corn was harvested as silage. Nitrogen uptake in the grain at these loading rates exceeded 50% in 1973 but was much lower the following year. The distribution of NO3 and C1 and the C1/NO3 ratios suggested that much of the unrecovered nitrogen was denitrified. (Kreager-FIRL)
W77-00610

HYDROGEN SULFIDE IN BOTTOM WATER NEAR A SEWAGE SLUDGE DUMPING SITE,
Brookhaven National Lab., Upton, N.Y. Dept. of Applied Science.
For primary bibliographic entry see Field 5A.
W77-00620

DEMONSTRATION OF A PLANNING PERSPECTIVE FOR WASTE WATER SLUDGE DISPOSITION.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 684, $7.50 in paper copy, $3.00 in microfiche. Report EPA-440M-76-001-b (WPD 01-76-01), January 1976. 183 p, 12 fig, 24 tab, 60 ref, 4 append.

Descriptors: *Waste water treatment, Analytic techniques, *Treatment facilities, *Plannin *Sludge disposal, Sludge, Waste dispos Management, Project planning, Cost analys Reclamation, Industrial wastes, Sewage tre ment, Water pollution, Ohio, Kentucky, Indiana

Waste water treatment and sludge dispo methods of plants in the Ohio-Kentucky-India region were investigated to test an application o methodology previously developed by the E vironmental Protection Agency. Fifteen of t area's 158 waste water treatment facilities and proposed facilities were selected for evaluatio The sample plants were surveyed by on-site i spection and analysis of available recor Background information is included such as the gion's economic and institutional characteristi and environmental setting, current waste wa treatment and sludge management practices, a applicable air and water quality and land use re lations. In application of the methodology, vario sludge management alternatives are analyzed terms of technical feasibility, costs, environmen impacts, sociopolitical implications, and other fa tors. Each facility is analyzed based on volumes sludge generated, characteristics of the sludg and current sludge disposal methods. Suitab sludge disposal alternatives are identified. Exce for the various disposal methods currently bei practiced by each waste water treatment pla wet land spreading appears to be the most unive sally applicable sludge disposal method. Four ternatives are presented for regional slud management systems, all involving four centr ized processing facilities with sludge dewateri capabilities. The dewatered sludge would disposed of in a regional landfill site, a reclamati site, suitable agricultural land, or by incinerati (Snyder-FIRL)
W77-00631

EXPERIMENTS TO INVESTIGATE SUBSTA TIAL LOAD OF SOILS AND TO PREDICT TI LONG TERM EFFECTS OF WASTES O GROUND WATER, (IN GERMAN),
Ministry of Agricultural Experiment Statio Brunswick (West Germany).
For primary bibliographic entry see Field 5B.
W77-00703

A MODEL OF RECYCLING AND POLLUTIO CONTROL,
Florida Univ., Gainesville. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-00711

THE EFFLUENT TREATMENT PLANT O BASF AG IN LUDWIGSHAFEN/RHINE,
Badische Anilin- und Soda-Fabrik A.G., Lu wigshafen am Rhein (West Germany).
For primary bibliographic entry see Field 5D.
W77-00742

A SYSTEMS APPROACH TO THE ECONOMI OF WASTE HANDLING,
Aston Univ., Birmingham (England). Dept. Chemical Engineering.
For primary bibliographic entry see Field 5D.
W77-00745

EVAPORATION AND THERMAL OXIDATIO OF LIQUID EFFLUENTS - BY BURNING WIT FLAME IN COMBUSTION CHAMBER.
For primary bibliographic entry see Field 5D.
W77-00765

REPORT TO THE CONGRESS ON OCEA DUMPING RESEARCH, JANUARY THROUG DECEMBER 1975.
National Oceanic and Atmospheric Administr tion, Washington, DC.
For primary bibliographic entry see Field 5G.

-00892

AN DUMPING; PROPOSED SITE IGNATION.
ronmental Protection Agency, Washington,
.
primary bibliographic entry see Field 5G.
-00985

TIME TO STOP KILLING THE OCEAN,
onal Wildlife Federation, Washington, D. C.
primary bibliographic entry see Field 5G.
-01046

Water Treatment and Quality Alteration

STANTIATION OF THE MAXIMUM PERSIBLE CONCENTRATION OF NIOBIUM IN TER BODIES, (IN RUSSIAN),
tut Gigieny Truda i Profzabolovsk (USSR).
primary bibliographic entry see Field 5C.
-00529

LIZATION OF ALUMIZED RED MUD IDS FOR PHOSPHORUS REMOVAL,
k, Crow and Eidsness, Inc., Gainesville, Fla.
ess Design Dept.
primary bibliographic entry see Field 5D.
-00587

RBON ADSORPTION OF AIR AND WATER LUTANTS,
. Cheremisinoff.
ution Engineering, Vol 8, No 7, p 24-32, July,
. 5 fig, 1 tab.

criptors: *Water treatment, *Activated car- *Adsorption, *Water purification, *Organic pounds, *Waste water treatment, Treatment ities, Equipment, Filtration, Economics, gn criteria, Municipal wastes, Industrial es.
tifiers: *Carbon adsorption.

use of carbon adsorption for the removal of nic compounds from water is discussed. Car- adsorption systems are of two types, nerative and nonregenerative. For operations hich daily carbon requirements are large or r constant use, granular carbons offer the ad- age of established methods of regeneration h greatly reduce costs and are suited to con- ous column design service. Powdered carbons r advantages in applications where the daily on requirements may not be large enough to rant the installation and operation of regenera- equipment. Adsorption studies with carbon in- te that most of the Environmental Protection ncy-proposed dissolved organic toxic chemi- can be removed from water by activated car- Adsorption treatment equipment can consist dsorbers holding granular activated carbon or mixed media filters. Granular carbon is arily used as a post-filtration adsorption em and is generally limited to large municipal ts and industrial water treatment applications. powdered form is more commonly used in icipal water plants and requires less capital in- ment. (Kreager-FIRL)
-00591

ULATIONS: REACTIONS AND RESOLUN,
ironmental Protection Agency, Washington, ., Office of Water and Hazardous Materials.
primary bibliographic entry see Field 5G.
-00615

SCALE INHIBITION AND COMPOUNDS THEREFORE,
Nalco Chemical Co., Oak Brook, Ill. (Assignee).
J. R. Stanford, and P. G. Vogelsang, Jr.
U.S. Patent No. 3,965,003, 6 p, 8 ref; Official Gazette of the United States Patent Office, Vol 947, No 4 p 1724, June 22, 1976.

Descriptors: *Patents, *Water treatment, *Water softening, *Scaling, Hardness(Water), Chemical reactions, Water quality.
Identifiers: *Scale inhibitors, Phosphated oxypropylated amines.

It has been found that phosphated oxypropylated amines and/or phosphated oxypropylated hydroxy hydrocarbons, with or without neutralization, are effective scale inhibitors in inhibiting scale deposits from water containing scaleforming chemicals. The phosphated oxypropylated amine is introduced into hard water or brine which is usually contacted with metal or other solid surfaces while maintaining a hardness-ion-precipitation-preventing quantity in the order of 0.5 per 100 parts per million (ppm) of the active effective compound. (Sinha-OEIS)
W77-00686

PORTABLE WATER STERILIZATION DEVICE,
G. C. Dawson.
U. S. Patent No 3,965,008, 4 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 947, No 4, p 1726, June 22, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Water pollution treatment, Water pollution control, Water quality control, *Potable water, Bacteria, Electrodes, Electrolysis, Equipment.
Identifiers: Portable equipment.

A light weight portable device is used for sterilizing water containing harmful bacteria. The components of the device are removably connected to one another, and may be separated and stored in a compact arrangement if the device is not in use. The device is particularly adapted for supplying potable water from contaminated water in areas that have been subjected to a disaster such as a flood, earthquake or the like. The components of the device may be readily assembled into a usable unit by persons having little or no mechanical skill. The invention includes a tank in which contaminated water may be placed. Two laterally spaced, oppositely disposed, elongate electrodes are situated within an L-shaped tubular member. Two terminals are provided for supplying alternating electric power to the electrodes at a voltage potential sufficient to kill harmful bacteria in the contaminated water which flows by gravity between the electrodes. (Sinha-OEIS)
W77-00688

ARTIFICIAL RECHARGE IN THE GRAND PRAIRIE, ARKANSAS,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W77-00734

5G. Water Quality Control

ISSUES RELATED TO INTERFACING WATER RESOURCE PLANNING WITH LAND USE PLANNING: DEVELOPMENT AND APPLICATION OF QUANTITATIVE PROCEDURES,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W77-00526

ENERGY, WATER, AND THE WEST,
American Association for the Advancement of Science, Washington, D. C.
For primary bibliographic entry see Field 6D.
W77-00542

AGRICULTURAL AND ENVIRONMENTAL IMPACTS AS A RESULT OF INCREASED DEMANDS FOR ENERGY DEVELOPMENT,
For primary bibliographic entry see Field 6D.
W77-00545

DON'T WASTE WATERWEEDS,
National Space Technology Labs., Bay St. Louis, Miss.
For primary bibliographic entry see Field 5D.
W77-00592

WASTEWATER RECYCLING ALONG TRANSPORTATION CORRIDORS,
Black, Crow and Eidsness, Inc., Clearwater, Fla.
L. A. Dove, and E. G. Rivers.
Transportation Research Record, No. 571, p 28-35, 1976. 6 ref.

Descriptors: *Waste water, *Water reuse, *Irrigation, *Transportation, *Institutional constraints, Reclaimed water, *Recycling, Florida, Cities, Reclamation, Nutrients, Feasibility studies, Florida.
Identifiers: Saint Petersburg(Fla).

The feasibility and desirability of irrigating green spaces along transportation corridors with highly treated waste water is discussed, with particular reference to a zero-discharge, total-recycling waste water system for the city of Saint Petersburg, Florida. The system produces a virus-free waste water effluent that retains the valuable nutrients essential to plant growth. It is demonstrated that policies of the American Association of State Highway and Transportation Officials and Federal and state governments have established at least a permissive attitude on the use of treated waste water for irrigation of transportation corridors. Research on utility-accommodation policies and practices as well as on the feasibility and health effects of waste water recycling along transportation corridors is recommended. Applications involving the reuse of treated waste water for land disposal throughout the United States are reviewed. (Kreager-FIRL)
W77-00611

REGULATIONS: REACTIONS AND RESOLUTION,
Environmental Protection Agency, Washington, D. C., Office of Water and Hazardous Materials.
A. W. Breidenbach.
American Water Works Association Journal, Vol. 68, No. 2, p 77-82, February, 1976. 1 tab.

Descriptors: *Legislation, *Potable water, *Regulation, *Water quality control, *Safety factors, Economics, Federal government, Monitoring, Quality control, Public health, Consumptive use, Water requirements.
Identifiers: *Safe Drinking Water Act, Interim primary drinking-water regulations, Environmental Protection Agency.

The Interim Primary Drinking-Water Regulations established by the Environmental Protection Agency in accordance with the Safe Drinking Water Act are discussed in terms of their development and objectives. Specific topics covered include: the applicability of the regulations to different types of public water systems, provisions in the regulations for sanitary surveys, the establishment of maximum contaminant levels, proposed requirements for measuring contaminant levels, the importance of quality assurance and record keeping procedures in relation to making the regulations effective, public comments received by the Agency concerning the regulations and proposed requirements, and the economic impact of the regulations. Total investment costs to community

water systems in compliance with the regulations are estimated to be between $1.1 and $1.8 million. Noncommunity systems are expected to invest an additional $24 million. (Kreager-FIRL)
W77-00615

DEMONSTRATION OF A PLANNING PERSPECTIVE FOR WASTE WATER SLUDGE DISPOSITION KNOXVILLE/KNOX COUNTY,
Environmental Protection Agency, Washington, D.C., Water Planning Div.
For primary bibliographic entry see Field 5D.
W77-00626

INSPECTION MANUAL FOR THE ENFORCEMENT OF NEW SOURCE PERFORMANCE STANDARDS: SEWAGE SLUDGE INCINERATORS,
PEDCo-Environmental, Inc., Cincinnati, Ohio.
T. W. Devitt, and N. J. Kulujian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 112, $5.00 in paper copy, $3.00 in microfiche. Report EPA 340/1-75-004, February, 1975. 73 p, 2 fig, 6 tab, 14 ref, 3 append.

Descriptors: *Waste water treatment, *Pollutant identification, *Analytical techniques, *Treatment facilities, *Sewage treatment, Incineration, Air pollution, Control, Inspection, Performance, Testing procedures, On-site tests, *Water quality standards.
Identifiers: Air pollution control.

Guidelines are presented for field inspections to determine whether new or modified sewage sludge incinerators comply with New Source Performance Standards (NSPS). These are particulate emission and opacity standards for incinerators burning sludge produced by municipal waste water treatment facilities. Key parameters identified during the performance test are used for comparison during subsequent inspections to determine the facility's compliance status. Descriptions of the sewage sludge incineration process, atmospheric emissions from these processes, and emission control methods are included. A detailed discussion of the inspection methods and types of records to be kept is also provided. A survey of emission limitations in state implementation plans is presented. (Snyder-FIRL)
W77-00627

WASTEWATER RECLAMATION PROJECT, ST. CROIX, U.S. VIRGIN ISLANDS,
Black, Crow and Eidsness, Inc. Gainesville, Fla.
For primary bibliographic entry see Field 5D.
W77-00630

COMPUTERIZED CITY-WIDE CONTROL OF URBAN STORMWATER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, J. W. Labadie, G. R. Trimble, and D. A. Wismer.
American Society of Civil Engineers, New York, NY, Urban Water Resources Research Program, Technical Memorandum No. 29, February 1976. 81 p, 22 fig, 5 tab, 52 ref, append. NSF GI38465.

Descriptors: *Control systems, *Sewers, *Storm runoff, *Overflow, *Optimization, *Information retrieval, Water pollution control, Storage, Detention, Reservoir operation, Mathematical models, *Dynamic programming, Systems analysis, Automatic control, Combined sewers.
Identifiers: *Combined sewer systems, Mathematical programming, Optimal control theory, Control logic, Urban water systems.

Automatic computer control has been applied in industry for over 15 years. The soft and hard technology developed thereby can be applied to control city-wide stormwater and combined sewer systems. Drainage patterns of urban catchments fit into a framework that suggests hierarchical control by minicomputers. Considerable opportunities for productivity improvement exist using such an approach to automatic control. At the same time, the hurdles to successful automation projects should not be minimized. There are at least five separate categories of models needed and the effectiveness of automation strategies is closely connected to the success of the mathematical models adopted. Total automatic control should be implemented in an evolutionary procedure reaching the closed-loop phase only after carefully completing the data logging, remote supervisory and computer assisted control phases. The decomposition approach to control fits naturally with the morphology of urban catchments and the emergence of hierarchical computer control systems. This approach seems most promising for overcoming the complexities to city-wide systems. (McPherson-ASCE)
W77-00634

TOXICITY OF PARAQUAT TO PARACALLIOPE FLUVIATILIS (AMPHIPODA),
Canterbury Univ., Christchurch (New Zealand). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-00666

IMPROVING THE QUALITY OF WATER RELEASES FROM RESERVOIRS BY MEANS OF A LARGE DIAMETER PUMP,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-00668

DEMONSTRATION OF WATER QUALITY ENHANCEMENT THROUGH THE USE OF THE GARTON PUMP,
Oklahoma Water Resources Research Inst. Stillwater.
J. E. Garton, and H. R. Jarrell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 601, Price codes: A02 in paper copy, A01 in microfiche. d Supplement to Completion Report, (1976). 21 p, 10 fig, 3 tab, append. OWRT C-5228 (No. 4215)(2).

Descriptors: Water quality, Lakes, *Pumps, *Pumping, *Stratification, Epilimnion, Thermocline, Hypolimnion, *Destratification, *Mississippi, Reservoir releases, Reservoir operation.
Identifiers: *Lake Okatibbee(Miss), *Garton pump.

In temperate climates, many lakes stratify during the summer. A typical stratified lake will have a warm oxygen-rich epilimnion, a thermocline, and a colder oxygen depleted hypolimnion. High levels of iron, manganese, hydrogen sulfide, and ammonia and dissolved hydrocarbons may occur in the hypolimnion. Many efforts have been made to destratify lakes, primarily by air bubbling. These methods require large energy inputs. A low-energy destratifier using a 1.83 m propeller to pump water downward from the surface has been used successfully to destratify a 100 acre lake (35 feet deep) for three years. This project involved using the pump on Lake Okatibbee, a broad, shallow lake of approximately 1537 ha (3800 Ac) with a maximum depth of slightly over ten meters. Its volume is approximately 5.2 x 10 m (42000 ac. ft.) At Lake Okatibbee the pump was placed over the intake structure, which contains the deepest waters of the lake, in an effort to enhance the quality of water relased from a low level outlet. From the data obtained it is evident that the Garton Pump can indeed induce water from the epilimnion to flow downward into the intake structure so that the water actually released has the characteristics of the near surface water of the lake. (See also W77-00668)
W77-00669

URBAN FLOOD WARNING AND WATERSH MANAGEMENT ADVANCES METROPOLITAN MELBOURNE,
Melbourne and Metropolitan Board of Wor (Australia).
For primary bibliographic entry see Field 6F.
W77-00670

MEASUREMENT OF URBAN RUNO PETROLEUM,
Rutgers - The State Univ., New Brunswick, N Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W77-00678

SPORT FISHERIES AND OFFSHORE OIL,
New York State Dept. of Environmental Con vation, Delmar. Div. of Marine and Coa Resources.
For primary bibliographic entry see Field 6G.
W77-00680

PROCESS FOR REMOVING DISPERS MATTER FROM WATER,
Exxon Research and Engineering., Co., Lind N. J. (Assignee).
C. A. Irani, and D. J. McHugh.
U.S. Patent No. 3,965,001, 5 p, 4 tab, 6 ref; O cial Gazette of the United States Patent Off Vol 947, No 4, p 1723, June 22, 1976.

Descriptors: *Patents, *Oil pollution, *Oily wa *Water pollution control, Water quality cont *Separation techniques, Sea water, Adsorpti Hydrogen ion concentration, Salinity.
Identifiers: Ballast water, Flocculated salts.

A process for separating dispersed matter fr water consists of adding a flocculated salt selec from the group consisting of aluminum, iron Group IIA of the Periodic Table of Elements additional oil. The salts adsorb the disper matter and oil and are separated from the wate precipitating the salts by adjusting the pH. process is useful for the removal of petrolium from sea water such as ballast water. preferred flocculated salts are magnesium hyd ide, strontium carbonate, and calcium carbon The flocculated salt is stirred with the water ph for about 1 to 30 minutes to substantially adso the dispersed matter. When agitation is disc tinued the oil, along with the flocculated salt dispersed matter will rise to the surface wher can be collected. Oxides or hydroxides of calc are preferred basic materials for adjusting the of sea water. Furthermore, the calcium salts th selves will not generally detract from the qualit the water which is returned to the sea after tr ment. (Sinha-OEIS)
W77-00684

PROCESS FOR REDUCING DISSOLVED IN GANIC ORTHOPHOSPHATES TO PPB LEVE IN AQUEOUS SYSTEMS,
Betz Labs., Inc., Trevose, P. (Assignee).
L. B. Magnusson.
U. S. Patent No. 3,965,002, 8 p, 4 fig, 1 tab, 2 Official Gazette of the United States Patent fice, Vol 947, No 4, p 1723-1724, June 22, 1976.

Descriptors: *Patents, *Water treatment, *W quality control, *Water pollution cont *Separation techniques, Phosphates, Chem precipitation, Chemical reactions, Waste w treatment, Water reuse.
Identifiers: Calcium phosph *Orthophosphates.

A process is described for the economical, h scale removal of soluble phosphates from sup waste or reusable waters. A slurry of seed crys of calcium phosphate, formed under critical co tions, is introduced into a reactor region. phosphate-containing water is fed into the re

der certain conditions of pH and calcium con-
t, and the dissolved phosphates are precipitated
a rate equal to the feed rate so that the residual
solved phosphorus level of the treated water is
ow 50 parts per billion. The pH of the water is
intained between 8.5 and 9.5 and the tempera-
e of the water is maintained at or below 30C.
nha-OEIS)
7-00685

MOVAL OF CONTAMINANTS FROM
ATER,
n Shipbuilding and Dry Dock Co., Chester, Pa.,
ssignee)
C. Garber.
S. Patent No. 3,965,004, 8 p, 5 fig, 7 ref; Offi-
l Gazette of the United States Patent Office,
1947, No 4, p 1724, June 22, 1976.

scriptors: *Patents, *Oil pollution, *Oily water,
ater pollution treatment, *Separation
hniques, Water quality control, Suspended
ids, Coalescence.
ntifiers: Ballast water, Ceramic pellets.

e oily water such as ballast from oil tankers, is
st passed through an oil-water separator such as
ravity--type which provides a rough separation
the oil and water. The effluent from this unit is
mped through a ceramic dewaxer containing
rous ceramic pellets. Waxes, asphalts, gums,
d similar materials in the separator effluent
fluent for the dewaxer) impinge upon and are
ained by these pellets, which may be
enerated when necessary. Effluent from the
waxer is passed through a sand filter to remove
rticulate matter and then through a coalescer,
ich coalesces the remaining oil droplets to
mplete the oil-water separation. (Sinha-OEIS)
7-00687

FANT MORTALITY AND WATER HARD-
SS IN THE UNITED STATES,
tional Inst. of Child Health and Human
velopment, Bethesda, Md. Epidemiology.
anch.
S. Spiers, S. G. Wright, and D. G. Siegel.
diatrics. 54(3), p 317-319, 1974.

scriptors: *United States, *Mortality,
lardness(Water), Regression analysis, Variabili-
Marginal income, Industrial production,
luman diseases, *Public health.
ntifiers: *Infant mortality(US), Great Britain.

cause of a negative association found between
fant mortality and water hardness in Great
itain, evidence for a similar relationship was
ught in 81 cities of the USA. With infant mortali-
rate as the dependent variable, its relationships
th 5 water indices and 7 other environmental
riables were examined. The results of multiple
gression analyses found no evidence for a nega-
e association between water hardness and in-
nt mortality. The only independent variables sig-
icantly associated with the dependent variable
re the percent of low income and the measure
industrialization.--Copyright 1975, Biological
stracts, Inc.
7-00698

MODEL OF RECYCLING AND POLLUTION
ONTROL,
orida Univ., Gainesville. Dept. of Economics.
Lusky.
nadian Journal of Economics, Vol. IX, No. 1, p.
-101, 1976. 1 fig., 6 ref.

scriptors: *Recycling, *Mathematical models,
ollution abatement, Waste treatment, Cost allo-
tion, *Waste disposal, Cost comparisons, Op-
nization, Byproducts.
ntifiers: Waste utilization.

A quantitative model attempts to eliminate the negative effect on consumers' utility of pollutant accumulation through comparison of altervative means of reducing the accumulated stock of pollution by recycling and/or disposal. Disposal of pollution materials is usually cheaper than recycling, but the model considers both the positive direct effect of the recycled good on the consumer's utility function and determines the best allocation of resources between the recycling activity and disposal. The procedure considers three activities--production of the original consumption good, production of the recycled good, and disposal--and optimizes the allocation of productive inputs (e.g., labor) between them in order to maximize consumer utility. Conclusions cite an optimal solution in which a decrease of the consumption of the original good is matched by an increase in the production and consumption of the recycled good. The government can assist this optimization through interventional means such as taxes, subsidies and cost guarantees, especially in the case of water and general refuse, which can be recycled commercially but where no viable markets have been developed for recycled products. (Harris-Wisconsin)
W77-00711

THE BIOLOGICAL CONTROL OF ALLIGATORWEED,
Agricultural Research Service, Gainesville, Fla. Biological Control Lab.
N. R. Spencer, and J. R. Coulson.
In: Proceedings on Biological Control of Aquatic Macrophytes, Environmental Protection Agency and University of Florida. Preprint, March 1975. 25 p. 6 fig., 27 ref.

Descriptors: *Biocontrol, *Alligatorweed, *Aquatic weed control, *Insects, Water hyacinth, Florida, Distribution, Predation, Southeast U. S.
Identifiers: Agasicles hygrophila, Amynothrips andersoni, Vogtia malloi, Beetles, Thrips, Moths.

Three South American insects suitable for use as biological control agents for alligatorweed have been cleared for use and are established in the southeast U.S. The first successful release of Agasicles hygrophila, the alligatorweed flea beetle, was in the Ortega River, Jacksonville, Florida. Agasicles prefers aquatic alligatorweed, so terrestrial and semi-terrestrial growth is not affected. Agasicles requires warm temperatures but not exceeding 26C, and is rarely found where alligatorweed is nutritionally deficient. Amynothrips andersoni was imported in 1966, but effective control of alligatorweed has not occurred because of their inability to fly and of predation by flower bugs. Vogtia malloi, the alligatorweed stem-borer, released in 1971, can survive over 30 days of 0 Celcius temperatures. It promises to be the most widespread of the introduced alligatorweed enemies. Biocontrol by Agasicles is still erratic and limited to areas without extreme temperature fluctuations. The stress being put on alligatorweed by these insects should reduce its population and make it an acceptable member of the aquatic plant community in the United States. (Buchanan-Davidson--Wisconsin)
W77-00714

HARVESTING THE OCEAN--ON LAND,
Alexander Marine Research Facility, Cayucos, Calif.
J. A. Alexander.
Agricultural Engineering, Vol. 56, No. 10, p. 66-68, 1975.

Descriptors: Design, *Shellfish farming, *Aquiculture, Crabs, Lobsters, Clams, Sculpins, Diets, Byproducts, Commercial shellfish, Recycling, Desalination, Pollution abatement, Sulfur, Smog, Waste treatment.
Identifiers: *Polyculture, *Mariculture, *Abalone, Shells, Waste utilization.

Mariculture facilities developed to produce abalone provide planting stock for fish, the shells are used for calcium buffering, flocculate minerals, and the entrails feed lobsters, crabs, and cabezon. Drifted kelp is used as feed. Water from the abalone tank flows to cabezon and clam tanks, then crab and lobster tanks finally to steelhead tanks. The system design should avoid copper; concrete is an excellent substrate. Most pumping systems are overdesigned. Shellfish tanks are buffered with crushed oyster or clamshells, which act as substrates for bacteria which break down growth-retarding metabolites into compounds useable by algae. Sulfur greatly accelerates production. Sulfur trioxide controls alkali, mosquitoes, and other pests; is useful in water conservation, and cuts fertilizer requirements. Sulfur-containing smog can be used to produce potable water and bacteria-free sludge for fertilizer or animal feed from domestic sewage. When seawater is used to scrub smog, over 90% of the salt is removed, and can be used for irrigation. Raceways simplify feeding and cleaning. Silo culture can produce enormous yields. Wastes from contained animal culture can be separated to provide potable water and bacteria-free sludge to feed shellfish and finned gill feeders. (Buchanan-Davidson--Wisconsin)
W77-00718

WATER POLLUTION INVESTIGATION: ERIE, PENNSYLVANIA AREA,
Betz Environmental Engineers, Inc., Plymouth Meeting, Pa.
For primary bibliographic entry see Field 5C.
W77-00724

THE POTENTIAL CONTRIBUTION OF FERTILIZERS TO WATER POLLUTION,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5B.
W77-00732

ARTIFICIAL RECHARGE IN THE GRAND PRAIRIE, ARKANSAS,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W77-00734

'ZERO-EFFLUENT' THROWAWAY SYSTEM,
Central Illinois Public Service Co., Springfield.
W. J. Holhut, T. R. Nelson, J. H. Wilhelm, and W. Ellison.
Power, Vol. 120, No. 8, p 66-69, August, 1976. 3 fig, 1 tab.

Descriptors: *Electric power industry, *Air pollution, *Sulfur compounds, *Liquid wastes, *Coals, Solid wastes, Waste treatment.
Identifiers: Sulfur dioxide, Flue gas desulfurization, *Zero effluent.

A throwaway flue gas desulfurization system of the double-alkali type which is designed to remove sulfur dioxide from coal-burning power plant stack gas under zero-effluent, closed-liquid-loop conditions is described. Key system operations include: particulate removal with a high efficiency electrostatic precipitator, multiloop wet scrubbing for isolation of collected tramp components from sulfur dioxide, lime post-precipitation of sulfur dioxide absorbed in a scrubber liquor rich in sodium sulfite, and liquid/solids post-treatment designed to assimilate all liquid wastes as surface moisture in dewatered waste solids. The process is scheduled for startup in late 1977 and is believed to be broadly applicable to high-chloride bituminous coal burned in power plants which require stringent management of solid wastes and liquid effluents. (Kreager-FIRL)
W77-00741

FIGHT AGAINST POLLUTION AND NUISANCES IN THE FRENCH STEEL INDUSTRY (LUTTE CONTRE LES POLLUTIONS ET NUISANCES DANS LA SIDERURGIE FRANCAISE),
For primary bibliographic entry see Field 5D.
W77-00749

STUDY ON TREATMENT OF TANKER DISCHARGED OILY WATER WITH IMPROVED TYPE SLOP TANK (KAIRYOGATA SUROPU TANKU NI YORU TANKA HAISUI SHORI NO KANKYU),
S. Fukuda, Y. Seike, M. Nakajima, and H. Taniguchi.
Mitsubishi Juko Giho (Mitsubishi Heavy Industries Technical Review), Vol. 13, No. 3, p 487-495, 1976. 15 fig, 3 tab, 3 ref.

Descriptors: *Oil industry, *Oil pollution, Ships, *Water pollution control, *Reclamation, Sludge, Design criteria, Performance, Pollution abatement, Separation techniques.
Identifiers: *Slop tanks(Oil).

The development of an improved slop tank as part of an effort to improve load-on-top systems for the prevention of oil pollution by tankers at sea is described. The slop tank consists of a sludge recovery compartment, an oil recovery compartment, and a settling compartment. Tests conducted by the Nagasaki Technical Institute indicate that the improved load-on-top system is capable of satisfying the discharge regulations for crude oil established at the 1973 Convention of the International Maritime Consultative Organization. A segregated ballast system which was adopted at the same convention is also very effective for the prevention of oil pollution at sea; however, the system is applicable only to tankers built hereafter, whereas the load-on-top system can be employed on existing tankers. (Kreager-FIRL)
W77-00750

QUATERNARY AMMONIUM SALTS CONTROL ODORS,
H. Schwartz.
Industrial Wastes, Vol. 22, No. 4, p 31, July/August, 1976.

Descriptors: *Food processing industry, *Odors, *Waste water treatment, *Ammonium salts, *Bactericides, Effluents, Costs, Toxicity, Organic compounds.
Identifiers: Quaternary ammonium salts, *Oder control.

The use of quaternary ammonium salts for the control of odors in industrial effluents is discussed, with particular emphasis on the food processing industry. Quaternary ammonium salts exert a double deodorant action in that they react directly with the molecules of odorants and also kill microorganisms that might cause future odors. Quaternary ammonium salts are strong germicides with low mammalian toxicity and they are also biodegradable. One disadvantage of these salts is that they are neutralized by organic matter such as protein or cellulose; however, a water-soluble complex of quaternary ammonium salts has been developed which overcomes this disadvantage. A successful application of quaternary ammonium salts for the control of effluent odor at a poultry processing plant is described. The daily cost of this odor control method runs about $2.00 for each 100,000 gallons of plant effluent treated. (Kreager-FIRL)
W77-00762

THE ENVIRONMENTAL IMPACT OF A LARGE TROPICAL RESERVOIR: GUIDELINES FOR POLICY AND PLANNING. BASED UPON A CASE STUDY OF LAKE VOLTA, GHANA, IN 1973 AND 1974,
Smithsonian Institution, Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-00767

ALTERNATIVE FUTURES FOR ENVIRONMENTAL POLICY PLANNING: 1975 - 2000,
Stanford Research Inst., Menlo Park, Calif. Center for the Study of Social Policy.
D. S. Elgin, D. C. MacMichael, and P. Schwartz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 796, Price codes: A13 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-540/9-75-027, October 1975. 286 p, 2 fig, 9 tab, 245 ref, 2 append. 68-01-2698.

Descriptors: *Planning, *Long term planning, *Decision making, *Forecasting, *Alernate planning, *Environmental effects, *Social change, *Ecosystems, *Pesticides, Projections, Social aspects, Environment, Social values.
Identifiers: *Social systems, Productive systems, 'Driving' trends.

A set of alternative future forecasts or scenarios are presented for the Environmental Protection Agency (EPA) to use in the planning of pesticide policy. The report is a tool for anticipating issues and gauging the utilities of policies to meet those issues in the years 1975 - 2000. Ten alternative future scenarios were developed through a procedure consisting of the 4 following steps: (1) trend analysis - both major social trends and trends relevant to the EPA were considered, such as value changes, international social changes, energy, food supply and demand; (2) skeletal scenarios - four critical 'driving' trends were identified, energy, climate, food and social values; (3) futures literature review - 16 descriptors of the future (ranging from research reports and non-fiction to science fiction) were assessed in a common format; (4) scenario expansion. Detailed future scenarios were organized into 3 general categories: industrial success within present structures and boundaries; industrial failure, meaning failure of these present institution; industrial transformation. Policy implications relevant to the EPA are: realization of EPA goals will be difficult from 1975 - 1985; a moderately environmentally conscious society will be present from 1985 - 1995; in the long run, environmental attitudes should support the EPA; in the short run (1975 - 1985), considerable tolerance for environmental degradation appears likely, becoming progressively less tolerant after 1985; a considerable number of policy reversals are probable; uncertainty and error must be included in policy planning processes. (Gentry-North Carolina)
W77-00768

ENVIRONMENTAL MANAGEMENT IN THE MALIBU WATERSHED: INSTITUTIONAL FRAMEWORK,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 6G.
W77-00769

PLANNING FOR STORM WATER MANAGEMENT,
Watkins (G. Reynolds) Consulting Engineers, Inc., Lexington, Ky.
For primary bibliographic entry see Field 6F.
W77-00770

PROGRAM SPECIFICATION FOR THE SEWER AND WATER ACCOUNTS PROCESSING MODULE - READING USAC PROJECT.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 661, Price codes: A11 in paper copy, A01 in microfiche. Prepared for the Department of Housing and Urban Development, April 1975. 189 p, 50 fig, 5 append. H-1212.

Descriptors: *Systems analysis, *Data collectio
*Data transmission, *Information retriev
*Computer programs, *Programming languag
Management, *Pennsylvania.
Identifiers: Sewer and Water Accounts Process
Module(SWAP), Physical and Economic Devel
ment Subsystem(PED Subsystem), Federal Urb
Information Systems Inter-agency Comm
tee(USAC), *Reading(PA).

The Sewer and Water Accounts Process
Module (SWAP) is a subset of the Physical
Economic Development Subsystem (P
Subsystem) designed to reflect data commonal
and is sponsored by the Federal Urban Infor
tion Systems Inter-agency Committee (USA
Objectives are to design a municipal informat
system that will eventually integrate munici
data and support municipal operation, plann
and management. The SWAP Module inclu
those operations securing information on
dividual accounts, updates this information, de
mines the volume of customer usage, produ
water and sewer bills, receives payment on b
and maintains account status. Operational appli
tions include applications processing, meter re
ing, cash receipts, bills and reporting. Using
SWAP Module saves clerical labor hours
processing bills and provides a thorough city p
perty data base. The SWAP Module is written
COBOL computer language appended to a 'r
section which is the heart for an integrated d
base management system and is common to
programs in the PED Subsystem. SWAP
developed on a Univac 9300-II processor with
kilobytes of memory. (Gentry-North Carolina)
W77-00773

GUIDE PLAN REPORT, ANDROSCOGG
RIVER BASIN, MAINE AND N
HAMPSHIRE, REGIONAL AND INTERSTA
OVERVIEW.
New England River Basins Commission, Bost
Mass.
For primary bibliographic entry see Field 6B.
W77-00774

THE DILEMMAS OF SETTING SEDIME
STANDARDS,
Colorado State Univ., Fort Collins. Dept. of C
Engineering.
J. Gessler.
In: Proceedings of the Third Federal Inter-Age
Sedimentation Conference, 1976; Den
Colorado, March 22-25, 1976. Water Resour
Council, Washington, D.C., Sedimentation C
mittee, p 2-158 - 2-167, 1976. 1 ref. OWRT A-0
Colo(2). 14-31-0001-4006.

Descriptors: *Standards, *Water quality s
dards, *Sediments, *Suspended solids, W
quality, Pollution, Pollutants, Rivers, Strea
Biota, Organic matter, Sampling, Geomorphol
Soil erosion, Biology, Sedimentation, Sedim
tology, Sediment control.
Identifiers: *Sediment standards.

Society has a multitude of interests in the qua
of our rivers as it relates to the movement of s
ment. Some of these interests are directly c
tradictory to each other. Reducing suspended s
ment loads in the interest of water quality as
lated to domestic and industrial use or as relate
recreational purposes may result in off-setting
delicate equilibrium of the river's biota due
changes of the food supply or may lead to dra
changes in the river's geomorphic structure. W
the biotic an geomorphic characteristics chang
from river to river, sediment standards can
have the form of absolute upper and lower li
for the total sediment transport. They must be
to the past history of the individual river. St
dards without enforcement are meaningless.
forcement will require monitoring the total s
ment transport at strategic locations. Selectio
such locations again leads to a dilemma. De

ns in sediment transport from some base line
ta must be investigated and their cause deter-
ined, whether it is natural or man-induced. In
der to do so, the deviations must be relatively
rong and the number of possible sources rela-
ely small. This demand puts the monitoring sta-
ns into the far upstream regions of the
atersheds. But this will require a large number of
ations which makes the monitoring at these loca-
ns economically unfeasible. Ideas for possible
lutions were suggested. Special emphasis was on
eas in which knowledge is insufficient for
aching any conclusions and will require exten-
ve research efforts. (See also W77-00775) (Sims-
WS)
77-00806

**NTRENCHMENT OF DRAINAGE SYSTEMS
WESTERN IOWA AND NORTHWESTERN
ISSOURI,**
gricultural Research Service, Columbia, Mo.
r primary bibliographic entry see Field 2J.
77-00831

**MULATION OF DISSOLVED OXYGEN AND
IOCHEMICAL OXYGEN DEMAND PLANTA-
ION CANAL, BROWARD COUNTY,
LORIDA, WITH AN EVALUATION OF THE
UAL-I MODEL FOR USE IN SOUTH
LORIDA,**
eological Survey, Tallahassee, Fla.
r primary bibliographic entry see Field 5B.
77-00852

**VALUATION OF ALTERNATIVE METHODS
F SUPPLEMENTAL RECHARGE BY STORM-
ATER BASINS ON LONG ISLAND, NEW
ORK,**
eological Survey, Albany, N.Y.
r primary bibliographic entry see Field 4B.
77-00853

**ARINE AND ESTUARINE SANCTUARIES.
ROCEEDINGS OF THE NATIONAL
ORKSHOP ON SANCTUARIES, 28-30
OVEMBER 1975, WASHINGTON, D. C.,**
irginia Inst. of Marine Science, Gloucester Point.
r primary bibliographic entry see Field 2L.
77-00888

**EPORT TO THE CONGRESS ON OCEAN
UMPING RESEARCH, JANUARY THROUGH
ECEMBER 1975.**
ational Oceanic and Atmospheric Administra-
n, Washington, DC.
OAA 3rd Annual Report. Submitted in com-
iance with Section 201, Title II of the Marine
otection, Research, and Sanctuaries Act of
72. (Public Law 92-532), June 1976. 43 p, 7 fig,
pend.

escriptors: *Municipal wastes, *Industrial
astes, *Water pollution sources, *Waste
sposal, Dredging, Water resources, Research
cilities, Continental Shelf.
entifiers: *Dredged material, *Ocean dumping,
arine Protection Research and Sanctuaries Act,
ederal agencies, Outer Continental Shelf.

his is the third annual report to the Congress on
e status of Federally sponsored ocean dumping
search as required by the Marine Protection,
esearch, and Sanctuaries Act of 1972, Title II,
ection 201. The report describes progress made
Federal agencies in ocean dumping research in
75, elements of interagency coordination, and
ture program direction. This report also includes
summary of 1975 activities directed to fulfilling
e requirements of Title II, Section 203, research
to disposal alternatives to ocean dumping. The
ree categories of ocean-dumped materials
scussed are dredged material municipal wastes,
d industrial wastes. (NOAA)
77-00892

MARINE POLLUTION ARTICLES IN THE LAW OF THE SEA SINGLE INFORMAL NEGOTIATING TEXT,
Rhode Island Univ., Kingston. Law of the Sea Inst.
D. Livingston.
Occasional Paper Series No. 31 (76-2), June 1976. 35 p, 40 ref. SG-04-6-158-44002.

Descriptors: *Law of the Sea, *Air pollution, *Pollution abatement, *Water pollution sources, *International law, Pollution, Conferences, Coasts, *Environmental effects, Continental Shelf.
Identifiers: Ocean pollution, Pollution sources, Ocean dumping, Ocean environments, Underwater environments, Ship wastes.

Articles on international prevention and control of marine pollution are contained in the document that emerged from the 1975 session of the UN Law of the Sea Conference (LOS). The marine environment was one of the major agenda items of Committee III and its portion of the Text contains 44 articles under the heading 'Protection and Preservation of the Marine Environment,' as well as additional sections on 'Marine Scientific Research' and 'Development and Transfer of Technology.' The analysis in this paper gives a coherence to the topic and focuses on pollution, excluding such cognate areas as scientific research and conservation of resources. The Text is in large part a product of recent international experience in controlling marine pollution and points the way toward a foundation or framework of general obligations which are to enhance and systematize both past efforts and future international negotiations on this subject and to mandate the enactment by states of relevant domestic legislation. (NOAA)
W77-00894

WISCONSIN NATURAL RESOURCE USE CONTROLS AND ASSISTANCE.
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6E.
W77-00915

THE CANADA WATER ACT, ANNUAL REPORT, 1974-1975.
Department of the Environment, Ottawa (Ontario).
Information Canada, Ottawa, 1975, 34 p.

Descriptors: *Canada, *Water law, *Water resources, *Water quality control, *Administration, Federal government, State governments, Comprehensive planning, Cost sharing, Food control, Social aspects, Economics, Governmental interrelations.
Identifiers: *Canada Water Act, Annual report, Provincial governments.

The provisions of the Canada Water Act embracing the formation of federal-provincial consultative committees, implementation agreements, planning studies and other cooperative arrangements, water quality management and eutrophication control, are summarized. To assist in the implementation of the Act, a decentralization program has been instituted for the negotiation and administration of federal-provincial water agreements; Regional Directorates have been organized in the Pacific and Yukon, Western and Northern Ontario, Quebec, and Atlantic Regions. A water resources research support program is continuing with grants of $1 million shared by 20 universities. The principal federal-provincial cooperative agreements under the Act are listed, showing the entities, cost-sharing arrangements, the objectives, and current status. The surveillance program to regulate phosphorus in laundry detergents and its effectiveness are described. The federal water management capability is supplemented by the Canada Centre for Inland Waters, the document reference center (WATDOC), and the national water quality data bank (NAQUADAT). The systematic collection and compilation of data on streamflow, water levels, sediment transport, groundwater, water quality and related information on glaciers, snow and ice is continuing under a cost-sharing agreement with the provinces totaling $8,760,200. Socio-economic studies are also undertaken under the provisions of the Act. (Auen-Wisconsin)
W77-00916

CARRYING CAPACITY PROTOTYPE INVESTIGATIONS IN THE STATE OF HAWAII, SUMMARY REPORT,
Hawaii State Office of Environmental Quality Control, Honolulu. Steering Committee on Carrying Capacity Studies.
For primary bibliographic entry see Field 6G.
W77-00917

OPTIMAL TAXATION POLICIES FOR CONSERVATION AND RECYCLING,
Florida Univ., Gainesville. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-00921

ENVIRONMENTAL PROTECTION AND SPATIAL ALLOCATION OF INVESTMENTS,
Erasmus Univ., Rotterdam (Netherlands).
For primary bibliographic entry see Field 6G.
W77-00922

CLADOPHORA IN THE GREAT LAKES,
Limnos Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5C.
W77-00928

A REGIONAL STORMWATER DRAINAGE MODEL,
For primary bibliographic entry see Field 4A.
W77-00940

STORM RUNOFF ROUTING TO A TIDAL OUTFALL: A CASE STUDY,
For primary bibliographic entry see Field 4A.
W77-00952

AN 'ENVIRONMENTAL' APPROACH TO STORMWATER MANAGEMENT IN THE ADELAIDE HILLS (AUSTRALIA),
South Australian Inst. of Tech., Adelaide.
For primary bibliographic entry see Field 4A.
W77-00953

1974 ANNUAL REPORT, (WASHINGTON NATURAL RESOURCES AND RECREATION AGENCIES).
1974, p. 17-23, 4 fig.

Descriptors: *Washington, *Ecology, *Legislation, *Water management(Applied), *Waste disposal, Penalties(Legal), Water pollution, Flood control, Water utilization, State governments, Discharge(Water), Planning, Water quality, Water law, Environmental effects, Economics, Permits.
Identifiers: Administrative regulations, Comparative law.

The Natural Resources and Recreation Agencies for the state of Washington have provided a broad view of the fiscal year 1974 operations and policies of the state Department of Ecology. The report reiterates the wholistic approach taken by the Department in dealing with controversial issues such as industrial waste discharge permits and whether or not to relax air and water quality standards to increase energy production. Also examined is the impact of 1974 state legislation on Departmental operations. This legislation includes (1) the Noise Act which was designed to complement the

Federal Noise Pollution Act of 1972, (2) the amendments to the state Environmental Policy Act, (3) a Baseline study bill to prevent and control oil pollution, and (4) the Forest Practices Act. The report contains a summary of Department activities in the following areas: civil penalties; air quality; solid waste management; litter control; shoreline management; water quality; flood damage reduction; water use; water planning; DDT spraying; and coordinated environmental permits. Graphs are presented indicating collected civil penalties for 1971-1974, ground and surface water right applications for 1967-1974, sewage facility construction funds for 1970-1974, and environmental grants to local agencies in fiscal year 1974. (Reinders-Florida)
W77-00957

A PLAN FOR MICHIGAN'S SHORELANDS.
Michigan Dept. of Natural Resources, Lansing.
For primary bibliographic entry see Field 6B.
W77-00958

NONPOINT POLLUTION: AN EPA VIEW OF AREAWIDE WATER QUALITY MANAGEMENT,
Environmental Protection Agency, Washington, D. C. Water Planning Div.
M. Pisano.
Journal of Soil and Water Conservation, Vol 31, No 3, p 94-100, May/June 1976. 7 p, 1 map, 2 photo.

Descriptors: *Federal Water Pollution Control Act, *Sedimentation, *Regulation, *Water quality, *Water pollution sources, Legal aspects, Legislation, Management, Monitoring, Penalties(Legal), Permits, Standards, Water policy, Water quality standards, Water treatment, Water resources, Water pollution.
Identifiers: *FWPCA Amendments of 1972, *Nonpoint sources(Pollution).

Point source pollution by industrial effluents and untreated municipal sewage has been the focal point of American pollution control efforts. If clean water goals are to be met by the 1983 target date, however, nonpoint sources must also be given attention. These sources include agricultural and silvicultural runoff, acid mine drainage, urban runoff, and sedimentation from construction sites. Nonpoint sources account for 92% of all suspended solids in water. The treatment of these solids is specified in the Federal Water Pollution Control Amendments of 1972. Section 208 calls for 'best management techniques' to prevent runoff, as well as other planning procedures. An analysis of the Amendment's potential for fighting nonpoint source pollution is included. (Frank-Florida)
W77-00959

NONPOINT POLLUTION AND WATER QUALITY MONITORING,
Georgia Univ., Athens. Inst. of Community and Area Development, and Georgia Univ., Athens. Inst. of Ecology.
J. Cooley.
Journal of Soil and Water Conservation, Vol 31, No 2, p 42-43, March-April 1976. 2 p.

Descriptors: *Water quality control, *Data collections, *Water pollution, *Water pollution sources, *Monitoring, Water pollution, Water pollution effects, Control, Control systems, Data transmission, Maintenance, Measurement, Operations, Regulation, Water quality, Erosion, State governments.

Monitoring of water quality will be necessary in the effort to control non-point sources of pollution. In addition, baselines of water quality must be established and a continuing assessment of control programs must be provided. Any monitoring system must characterize and define trends in the physical, chemical, and biological condition of water. This monitoring, which should be conducted by the state, will determine if management practices are obtaining the desired results. Because of the cost involved in monitoring all major nonpoint sources both upstream and downstream, the author suggests that sites should be established at carefully selected indicator operations of nonpoint sources within different regions of the state. The author acknowledges, however, that current problems make such site selections untenable for the present. Regardless of site location, periodic samples should be taken when triggered by certain climatic events. The parameters of this monitoring should be controlled by a specially developed systems model of the receiving body of water. The mere outlay of large amounts of money does not guarantee quality; rather, careful preparations should be made before any monitoring system is implemented. (Frank-Florida)
W77-00960

INSTITUTIONAL ARRANGEMENTS FOR LAKE MANAGEMENT IN WISCONSIN,
Wisconsin Univ., Madison. Environmental Resources Unit.
For primary bibliographic entry see Field 6E.
W77-00966

NEW FEDERAL REGULATIONS FOR DREDGED AND FILL MATERIAL,
Smith (David D.) and Associates, San Diego, Calif.
D. Smith.
Environmental Science and Technology, Vol 10, No 4, p 328-33, April 1976. 6 p, 1 illus, 2 photo, 1 chart.

Descriptors: *Navigable waters, *Federal Water Pollution Control Act, *Dredging, *Federal project policy, *Environmental effects, Regulation, Legal aspects, Legislation, Management, Permits, Water policy, Channel improvement, Hydraulic mining, Mining, Excavation, Flood protection, Flow, Judicial decisions.
Identifiers: *Fill permits, *Army Corps of Engineers.

In March 1975, the U. S. District Court for the Districts of Columbia ruled that the responsibility of the U.S. Army Corps of Engineers (ACE) to regulate the discharge of dredged or fill material to navigable waters extends to all waters of the United States. The court also directed the Corps to revise its regulatory procedures accordingly, and the Environmental Protection Agency (EPA) to issue the applicable discharge guidelines forthwith. Prior to the 1975 decision, the Corps had limited the exercise of its responsibilities to the navigable waters of the U. S. This could be reasonably defined, but 'all water' is a vague phrase not defined by Congress or the courts. The purpose of this article is to explain the interpretation of 'all waters' ultimately arrived at, as well the EPA guidelines that followed the decision. These guidelines provide no single technical evaluation procedure for nationwide use; rather, they provide for various types of test procedures, including mechanical analyses, elutriate tests, total sediment chemical analyses, bioassays, and biological evaluations. These guidelines must be reviewed at least once every three years and revised as indicated by the accumulation of information from pertinent research. (Frank-Florida)
W77-00967

PELAGIC TAR,
For primary bibliographic entry see Field 5B.
W77-00969

PAYING TO POLLUTE.
Environment, Vol 18, No 5, p 16-20 (1976). 5 p, 3 photo.

Descriptors: *Water policy, *Water pollution treatment, *Water pollution control, *Economic efficiency, *Costs, Benefits, Planning, Marginal utility, Marginal productivity, Marginal benefits, Air pollution, Marginal costs, Pollution charges(Taxes).
Identifiers: *Organisation for Economic Co-Operation and Development.

There are two main schools of thought on pollution control: those who advocate the direct imposition on polluters of regulations, usually emission standards; and those who argue for a levy on polluting wastes. The latter is the pollution charge approach, which is being evaluated in Europe by the Organisation for Economic Co-Operation and Development (OECD). OECD's study has ascertained that, even when used as the principal policy instrument, pollution charges are always combined with direct control. Several countries are planning to turn to pollution charges, among them Germany, the Netherlands, and France. Examples of the use of pollution charges are given in regard to water pollution, air pollution, noise and solid wastes. The following conclusions are reached: (1) that systems of charges should be as simple and easy to manage as possible; (2) that decentralization of management should be used to provide the best pollution charge framework; (3) that the public should be involved in running the system of charges; and (4) that charges should rise over time so as to strengthen the disincentive until the desired environmental objectives are attained. (Frank-Florida)
W77-00972

PROTECTION OF THE MARINE ENVIRONMENT FROM POLLUTION,
R. A. Frank.
Georgia Journal of International and Comparative Law, Vol 6, p 73-91 (1976). 19 p, 55 ref.

Descriptors: *International law, *United Nations, *Law of the sea, *Pollution, *Oceans, Water pollution, Environmental effects, Water pollution sources, Mining, Oil spills, Oil wastes, Legal aspects, Water law, Navigation, Water pollution control, Foreign countries.

Discussed here are six issues relating to the protection of the marine environment from pollution in the context of the Third United Nations Conference on Law of the Sea. They are: (1) vessel source pollution; (2) control of deep seabed mining; (3) landbased sources of pollution; (4) pollution from resource activities in the economic zone; (5) environmental monitoring and assessment; and (6) the double standard. Concerning the double standard, developing nations have insisted that they be subjected to less stringent requirements than those required of the developed countries with respect to virtually every environmental protection obligation. The author concludes that clear limitations should be placed on any double standard. They would include limiting it to land-based activities, requiring a case by case showing that substantial economic injury will result if pollution controls of a certain kind are adopted, and insuring that toxic and hazardous substances remain under the most stringent pollution control standards. None of these, however, has yet been reduced to draft form. (Frank-Florida)
W77-00973

MAN'S EFFECT ON THE QUALITY OF OUR WATER,
Central and Southern Florida Control District, West Palm Beach.
For primary bibliographic entry see Field 5C.
W77-00974

OF PCB PPMS FROM GE AND A SNAFU FROM EPA AND DEC,
For primary bibliographic entry see Field 5A.
W77-00978

SELLING OF THE SHELF,
ıchell.
bon, Vol 77, p 44,46-63, May 1975. 19 p, 1
3 illus.

riptors: *Continental shelf, *Oil pollution, industry, *Offshore platforms, *Drilling, ng equipment, Oil, Oil fields, Water pollu- Engineering structures, Coasts, Shores, Ex- tion, Exploitation, Oil reservoirs, Gasoline, wastes, Geologic formations, Secondary ery(Oil), Water pollution treatment.
ifiers: *Coastal Zone Management Act, stal zone management, *Environmental im- tatement, Cape May, Santa Barbara.

Coastal Zone Management Act of 1972 was ned to help coastal states inventory their front resources and draw up long-range plans nage those resources wisely, as well as to de planning grants to speed up the process. r President Ford, however, the intent of the ation has been avoided, and indiscriminate ore drilling has been encouraged in an effort crease the gross national product. Like g, the leasing of offshore areas has also eded at an astronomic rate. Areas encom- d by these leases include Cape May, Long d, the Alaskan shore, and a large stretch of alifornia coastline, all of which will subject to tial oil spillages on the order of the Santa ara disaster of a few years ago. Yet even with threats, no federal thought is being given to ing for the survival of these coastal areas. is unfortunate since potential solutions do For instance, increased federal efforts in erving oil and gas, especially in the auto in- y, could obviate much of the need for new g. Until such efforts are initiated, however, l companies will continue to push for speedy nsion of offshore drilling. (Frank-Florida)
00979

PORATE RESPONSIBILITY IN SILVER
chell.
bon, Vol 77, p 47-61, March 1975. 15 p, 1
6 photo.

riptors: *Industrial wastes, *Lake Superior, er pollution, *Silicates, *Environmental ef- Environment, Environmental sanitation, In- ial production, Industrial plants, Economics, omic feasibility, Economic efficiency, omic impact, Employment, Regional omics, *Minnesota.
ifiers: *Silver Bay(Minn), *Injunctive relief, onite tailings.

rve Mining Company of Silver Bay and Bab- Minnesota, has been involved in one of the environmental struggles of the 70's. Several ago, environmentalists instituted legal edings to enjoin Reserve from dumping 0 tons of taconite tailings into Lake Superior day. After the federal judge was informed he tailings contained cancer causing silicate , an injunction was issued. In issuing the in- ion, the judge rejected a Reserve proposal would have allowed the dumping to continue ew process was instituted that would make hat all deposits went right to the bottom. The ction was stayed by a circuit court and this was upheld by the Supreme Court without ent. Although other companies have ged to dump on land, Reserve continues to the idea as being economically impossible. until the litigation is settled, Reserve will nue to dump taconite tailings into Lake Su- r. Despite the dumping's adverse effects, is not much anyone can do to stop it. (Frank- la)
00980

SION TO LEASE OUTER CONTINENTAL F LANDS,
achusetts Energy Policy Office, Boston.

For primary bibliographic entry see Field 6E.
W77-00981

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS, GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 40, No 233, p 56436-42, December 3, 1975. 7 p.

Descriptors: *Federal Water Pollution Control Act, *Chemical industry, *Waste water treatment, *Water quality standards, *Regulation, Standards, Administrative agencies, Federal government, Biochemical oxygen demand, Chemical oxygen demand, Chemicals, Industrial wastes, Toxicity, Potable water, Effluents, Costs, Economic impact, Water quality control, Pollutants, Public health, Aquatic life, Cost-benefit analysis, Pollution.
Identifiers: *Carcinogens, Administrative regulations.

The Environmental Protection Agency (EPA) has established final amendments to the regulations setting guidelines and standards for effluent limitations for the ethylene oxide, ethyl glycol, methyl amines, and oxo chemicals production subcategories of the organic chemicals manufacturing point source category. Both the guidelines representing the degree of effluent reduction attainable when applying the best practicable control technology currently available and the standards of performance for new sources set limitations on the effluent characteristics of BOD5, TSS, and pH. The guidelines representing the degree of effluent reduction attainable by application of the best available technology economically achievable include limitations on the effluent characteristics of COD, BOD5, TSS, and pH. The EPA has summarized the comments made on the regulations by members of the chemical industry and has responded to the comments. In an analysis of the potential benefits and costs of the regulations, the EPA points out that since some organic compounds are carcinogenic and some are toxic to aquatic life, their presence in the nation's water is a potential health hazard. (Capehart-Florida)
W77-00983

ENVIRONMENTAL PROTECTION AND ENHANCEMENT (GENERAL GUIDANCE TO ELEMENTS WITHIN THE DEPARTMENT OF THE ARMY ON ENVIRONMENTAL PROTECTION).
Office of the Cheif of Engineers (Army), Washington, D. C.
Federal Register, Vol 40, No 232, p 55962-83, 55999-56013, December 2, 1975. 37 p, 16 fig, 2 map.

Descriptors: *Environmental effects, *Regulation, *Pollution abatement, *Environmental control, *Federal government, Water pollution control, Air pollution, Administrative agencies, Standards, Water treatment, Waste water treatment, Water conservation, Pollutants, Effluents, Recycling, Oil spills, Toxins, Navigable waters, Legislation, Landfills, Flood plains, Channels, Federal Water Pollution Control Act, Construction.
Identifiers: *Administrative regulations, *Environmental impact statement.

The Department of the Army is adopting a regulation specifying policies, responsibilities, and procedures for the protection and preservation of environmental quality. The goal of the Army is to minimize adverse environmental effects without impairing the Army's mission. Responsibilities for reviewing environmental policy, proposing new programs, and coordinating activities are delegated to specific branches within the Army. An annual status report will be prepared on environmental programs and activities. Subpart B of the regulation deals with environmental considerations in Army actions. The types of actions requiring an environmental impact assessment or an environmental impact statement (EIS) are listed. The factors to be considered in determining the environmental impact are detailed. The outline of an EIS is included. Subpart C covers the procedures for implementing the Federal Water Pollution Control Act. Subpart D relates to air pollution abatement procedures. Subpart I contains the procedures for control of discharge of oil and hazardous substances. Subpart J specifies the reporting procedures to be followed within the Army to control environmental pollution from existing facilities. Sample reports are included. (Capehart-Florida)
W77-00984

OCEAN DUMPING; PROPOSED SITE DESIGNATION.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 41, No 85, p 18094-95 April 30, 1976. 2 p.

Descriptors: *Toxins, *Chemical wastes, *Incineration, *Gulf of Mexico, *Sites, Waste disposal, Toxicity, Oceans, Administrative agencies, Federal government, Regulation, Wastes, Ultimate disposal, Disposal, Water quality, Water quality control, Organic compounds, Chlorine, Water pollution sources.
Identifiers: *Ocean disposal, Organic chlorine compounds.

The Environmental Protection Agency is proposing the designation of a site in the northwestern part of the Gulf of Mexico for use in the incineration of highly toxic chemical wastes. The primary use of the site will be for the incineration of organo-chlorine wastes. Studies on the area of the proposed site show little or no environmental impact from incineration of chemical wastes. Ocean incineration has therefore been determined to be an environmentally sound alternative method for disposal of these wastes. (Capehart-Florida)
W77-00985

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 41, No 30, p 6281-3 Feb 12, 1976. 3 p.

Descriptors: *Lumbering, *Forest management, *Water quality standards, *Permits, *Regulation, Judicial decisions, Administrative agencies, Federal government, Standards, Pollutants, Water pollution, Percolation, Precipitation(Atmospheric), Runoff, Navigable waters, Burning, Pesticides, Lumbering, Gravels, Rocks, Water quality control.
Identifiers: *Administrative regulations, *National Pollutant Discharge Elimination System.

In compliance with an order of the federal district court, the Environmental Protection Agency (EPA) is proposing regulations which apply the National Pollutant Discharge Elimination System permit program to point source discharges in the silviculture category. Previous regulations excluded this category from permit requirements. The proposed regulations distinguish between point source and non-point source water pollution. Silvicultural activities resulting in water pollution are not subject to the permit program if the pollution is caused by natural processes and is not traceable to any specific facility. Excluded activities include nursery operations, site preparation, controlled burning, pesticide control, and harvesting operations. Permits with effluent limitations will be required for discharges from point sources such as rock crushing, gravel washing, log sorting and log storage facilities. (Capehart-Florida)

W77-00986

TRAIN V COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. (CONFLICT OF FEDERAL WATER POLLUTION CONTROL ACT AND THE ATOMIC ENERGY ACT).
For primary bibliographic entry see Field 6E.
W77-00987

GARBAGE POLLUTION, DISPOSAL INTO STREAMS.
For primary bibliographic entry see Field 6E.
W77-00990

PROTECTION OF PUBLIC WATER SUPPLY.
For primary bibliographic entry see Field 6E.
W77-00991

1971 WATER RESOURCES ACT.
For primary bibliographic entry see Field 6E.
W77-01002

APPROPRIATION.
For primary bibliographic entry see Field 6E.
W77-01012

A METHOD FOR DETERMINING THE DISPERSIVE CAPACITY OF PREPARATIONS USED FOR REMOVING OILS FROM WATER SURFACE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W77-01028

ANTHROPOGENIC MORPHOGENESIS OF THE RELIEF OF THE LOWER DON, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
For primary bibliographic entry see Field 2H.
W77-01039

WATERS--FISH AND GAME--DEPOSIT OF PESTICIDES IN PUBLIC WATERS.
For primary bibliographic entry see Field 6E.
W77-01042

RESERVE MINING CO V CITY OF DULUTH (FILTRATION OF LAKE SUPERIOR BY CORPS OF ENGINEERS).
For primary bibliographic entry see Field 6E.
W77-01043

IT'S TIME TO STOP KILLING THE OCEAN,
National Wildlife Federation, Washington, D. C.
K. Kamlet.
National History, Vol 13, No 3, p 18-21, April, 1975. 4 p, 1 map, 2 photo.

Descriptors: *Oceans, *Water pollution, Water pollution effects, *Sludge, *Sludge disposal, Administrative agencies, Regulation, Organic wastes, Solid wastes, Wastes, Fish, Cost analysis, Cost comparisons, Waste disposal, Permits, Ships.
Identifiers: *Ocean dumping, *Marine protection, Research and Sanctuaries Act of 1972.

Ocean dumping of wastes and sewage is continuing at a steady and high rate. As a result of this dumping, large areas of ocean are being seriously harmed, and fish catches are being depleted. Part of the reason for this increase in harmful dumping is that the Marine Protection, Research and Sanctuaries Act of 1972 which was designed to regulate ocean dumping is not being enforced. Under this Act, dumpers of dredge spoils are supposedly required to obtain a permit from the Army Corps of Engineers while all other dumpers are required to obtain a permit from the Environmental Protection Agency. Unfortunately, there are numerous ways by which these agencies may circumvent the regulations they are supposed to enforce. Two other major obstacles to effective long-term regulation of ocean dumping are that of accurately measuring the effects of such dumping, and the present absence of feasible alternatives. The author concludes that man's chance of survival will be seriously reduced if steps are not taken to prevent the indiscriminate pollution of the sea caused by dumping. (Frank-Florida)
W77-01046

MID-SHIAWASSEE COUNTY CONCERNED CITIZENS V TRAIN (ENVIRONMENTAL IMPACT AS TO A PHYSICAL-CHEMICAL MODE OF TREATMENT FOR A WASTE-WATER TREATMENT PLANT).
For primary bibliographic entry see Field 6E.
W77-01048

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ISSUES RELATED TO INTERFACING WATER RESOURCE PLANNING WITH LAND USE PLANNING: DEVELOPMENT AND APPLICATION OF QUANTITATIVE PROCEDURES,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W77-00526

SYSTEMATIC APPROACH TO WATER RESOURCES PLAN FORMULATION.
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB259 338, Price codes: A13 in paper copy, A01 in microfiche.
Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics, Technical Report 187, July 1974. 173 p, 60 fig, 26 tab, 50 ref. Edited by J. C. Schaake, Jr. OWRT C-4232(9084)(1).

Descriptors: *Optimization, *River basins development, *Decision making, *Comprehensive planning, Model studies, *Optimum development plans, Simulation analysis, *Pennsylvania, Multiple-purpose projects.

A new computational approach has been developed for the practical solution of the nonlinear, stochastic optimization problem representing many complex river basin decision problems. This approach involves a simulation, model, a computational scheme for estimating marginal net benefits due to changing each decision variable, and a search procedure. The approach was tested by application to three example problems using data from an actual river basin planning study. An early motivation for this research was the need for an improved planning approach to resolve the great differences between screening (or optimization) model results and simulation model results when these systems analysis tools were used in actual planning practice. Screening models of complex systems usually must neglect important stochastic or nonlinear relationships (or else become computationally intractable). Since the role of screening models in planning would be to aid in plan formulation and since screening models fail to recognize very important aspects, it follows that better plans may exist than would be suggested by existing screening models. The research results have not yet been applied in an actual planning project, and its was beyond the scope of the work to make such an application. Nevertheless, the need for this research did derive directly from a river basin planning study supervised by the principal investigator. Also, the simulation model developed under this project has been u in a study for the U.S. Army Corps of Engineer Water Resource Development in the South Cen Pennsylvania Region. (See W77-00533 thru W 00535)
W77-00532

ROLE OF PARTIAL GRADIENT ESTIMATI BY SIMULATION IN WATER RESOUR PLAN FORMULATION, PART I,
Massachusetts Inst. of Tech., Cambridge. Dept Civil Engineering.
J. C. Schaake, Jr., and T. B. Facet.
In: Systematic Approach to Water Resources I Formulation, Technical Report No. 187, July 19 112 p, 18 fig, 17 tab, 17 ref. OWRT 4232(9084)(1).

Descriptors: *Mathematical models, *Estimat *Simulation analysis, Model studies, Plann *Optimum development plans, River b development, *Optimization.
Identifiers: *Partial gradients(Estimation).

A simulation-optimization mathematical model design purposes in water resources planning presented. The model accounts for the non-lin stochastic nature of water resources systems explicitly evaluates short term costs if a w requirement is not met. Multipurpose, multi- system can be analyzed by the model. The ma matical model consists basically of two parts: (simulation procedure, and (2) a search techni The focus in this study has been the estimatio partial gradients of the response function du the normal execution of the simulation model. ferent components of the benefit function and h they affect the marginal benefit of a partic variable are discussed in detail. A gen procedure to estimate the marginal contributio the benefit function of a unit change in any va ble in the system is developed. Particular rules each type of node in the system are given. model was applied to three different river b configurations involving reservoirs and irriga areas, but other activities such as municipal w supply, low flow ground water supply, etc., r be studied. Comparisons between the results tained by the proposed model and those fro deterministic linear programming model are m (See also W77-00532)
W77-00533

A SEARCH TECHNIQUE FOR FORMULATI IMPROVED WATER RESOURCES CONFI RATIONS, PART II,
Massachusetts Inst. of Tech., Cambridge. Dept Civil Engineering.
K. M. Leytham.
In: Systematic Approach to Water Resources I Formulation, Technical Report No. 187, July 19 132 p, 42 fig, 9 tab, 23 ref. OWRT C-4232(9084)(1).

Descriptors: *Optimization, *Simulation analy Model studies, *Planning, Reservoirs, W resources development, Optimum developm plans.
Identifiers: *Gradient estimates, *Multi-objec theory, Search techniques.

This study shows the development of a sea package for use in the optimization of non-lin stochastic water resources systems from a m objective viewpoint. Multiobjective theory c bles one to aggregate the net benefits toward v ous objectives as a sum of weighted bene which may be regarded as the response of system for a certain project configuration. Rec advances in simulation techniques have resulte simulation models which not only predict responses of a system but also provide estima of the partial gradients on the response surfa These gradient estimates are useful in that they dicate the changes in project configurations wh would result in an improved response. This st

aimed at finding a search technique which can
ke efficient use of the inexact gradient esti-
es in locating the maximum point on the
onse surface. Study and testing of various
rch techniques indicated that Steepest Ascent
a modified version of Pattern Search made the
t efficient use of gradient estimates. These two
hods were combined in a small search package
ch was then tested, in combination with a
ulation model, in the optimization of several
mple water resource systems. The results
wed the combination of search and simulation
e very effective on small systems at least. (See
W77-00532).
7-00534

REENING MODELS IN WATER
SOURCES PLANNING, PART III,
ssachusetts Inst. of Tech., Cambridge. Dept. of
il Engineering.
A. McBean.
Systematic Approach to Water Resources Plan
mulation, Technical Report No. 187, July 1974.
, 9 ref.

scriptors: *Model studies, *Planning,
timization, Mathematical models, Simulation
lysis, Linear programming.
ntifiers: **Screening models, *Deterministic
dels.

study has briefly indicated some of the ad-
tages and disadvantages of a number of the op-
ization models that have been employed in
er resource systems planning. The various
es of models are not panaceas that handle all
blems of the system planner, nor are they
hout their limitations; but they do provide a
verful tool that can be very effective. The dif-
lty in model selection becomes one of arriving
n appropriate balance between model realiza-
, data sophistication, and computational
uirements. (See also W77-00532)
7-00535

RKSHOP PROCEEDINGS: CITIZEN PAR-
IPATION IN WATER RESOURCES DECI-
N-MAKING,
ssachusetts Univ., Amherst. Water Resources
earch Center.
primary bibliographic entry see Field 6B.
7-00730

RRYING CAPACITY PROTOTYPE IN-
STIGATIONS IN THE STATE OF HAWAII,
MMARY REPORT,
waii State Office of Environmental Quality
ntrol, Honolulu. Steering Committee on Carry-
Capacity Studies.
primary bibliographic entry see Field 6G.
7-00917

TIMAL EXPLOITATION OF MULTIPLE
OCKS BY A COMMON FISHERY: A NEW
THODOLOGY,
tish Columbia Univ., Vancouver. Inst. of
mal Resource Ecology.
Hilborn.
rnal of the Fisheries Research Board of
ada, Vol. 33, No. 1, p. 1-5, 1976. 2 fig., 1 tab.,
ef.

scriptors: *Dynamic programming, *Marine
eries, *Fish harvest, *Optimization.
ntifiers: *Mixed fish stocks.

chnique superior to the best methods currently
se to calculate optimal harvest rates for mixed
stocks using stochastic dynamic programming
escribed. The main advantages of this method
(1) The stock recruitment model can have un-
ted complexity as the number of parameters in
model does not affect the computation
uired or the reliability of results; (2) parameters may be stochastic but as the number of stochastic possibilities considered for the parameter values increases so does the computation time; (3) there may be judgmental uncertainty about parametric values; while this is analogous to stochastic variability of parameters, it is conceptually distinct; (4) the objective functions (maximization) can be as complex as desired; it need not be restricted to long-term catch--it can be catch dollar value, total employment generated from the fishery, or any combination of factors; (5) discounting rates can easily be introduced. The total objective does not need to be summed over time but may be multiplicative over time. Although the number of computations goes up linearly with the number of time intervals, it does go up geometrically with the number of state variables and stochastic parameters, thus practically optimizing models are restricted to, at most, five state variables. (Auen-Wisconsin)
W77-00920

6B. Evaluation Process

ISSUES RELATED TO INTERFACING WATER RESOURCE PLANNING WITH LAND USE PLANNING: DEVELOPMENT AND APPLICATION OF QUANTITATIVE PROCEDURES,
INTASA, Menlo Park, Calif.
C. H. Jolissaint, W. B. Betchart, K. Skurski, and S. Davenport.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 331, Price codes: A11 in paper copy, A01 in microfiche.Final Rpt. IRP 74-01, May 1976. 210 p, 26 fig, 60 tab, 80 ref, 4 append. OWRT C-6057(5207)(1). 14-31-0001-5207.

Descriptors: *Regional analysis, *River basin development, Water resources development, Land resources, Cost sharing, *Financial feasibility, Long term planning, Low flow augmentation, Water quality control, Multiple purpose projects, *Planning, *Coordination, *Land use, *Comprehensive planning, Cost analysis, Community development.
Identifiers: Regional coordination, Simplified modeling, Fiscal cost analysis, Community development planning, Site development cost modeling, Regional water balance.

This research addresses three of many requirements for interfacing water and land resources planning: (1) need to coordinate separate resource planning activities and assign regional priorities; (2) need to relate environmental, social and economic benefits and costs of community land use plans to similar decision criteria at the regional water resources planning level; (3) need to quickly convert land use information into water resource requirements and costs. Results include: (1) simplified quantitative procedures based on regional water, land and mass balance relationships and demonstrated in the Platte River, Nebraska Level B regional study; (2) an improved fiscal cost analysis procedure for short term land use decisions based on economic, social and environmental goals, demonstrated in Richmond, Calif.; (3) extension of site development cost models to analyze housing cost associated with community use policies, demonstrated in Napa, California. Recommendations include: The physical conservation relationships developed in this study should be further refined, especially for mass balance related to water quality determinations, in order to focus these quantitative procedures toward integration of water quality planning with water quantity planning. A study should be undertaken to implement the project's fiscal analysis methodology in a community undergoing development pressures in order to obtain operational experience with incorporating the fiscal analysis procedure in the urban land use planning process. A further study should be made predicting demand characteristics for housing. Using the housing cost models developed to provide the cost for the type of house being demanded in an area would provide input into the effect that land use policies associated with the general plan will have on the future cost of homes in a community.
W77-00526

TECHNOLOGY ASSESSMENT FOR NEW WATER DEVELOPMENT PROJECTS, (VOLUME I),
Virodyne Corp., Littleton, Colo.
J. C. Kellogg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 276, Price codes: A21 in paper copy, A01 inn microfiche. Completion Report, August 1976. 480 p, 63 fig, 32 tab, 177 ref. OWRT C-4319(9062)81).

Descriptors: Technology, Water resources development, Planning, *Projections, Forecasting, Input-output analysis, *Southwest U.S., *Alternative planning, *Water allocation(Policy), Arid lands, *Future planning(Projected), *Long-term planning, Project planning, Economic impact, *Social impact.
Identifiers: *Arid West, *Technology assessment.

Given historical trends and present conditions in the arid West, new water supplies are expected to have far-reaching consequences for the economic life of the region and drastic alterations in lifestyle. In using the theme that water resources planning is future-oriented, methods of technology assessment are utilized for tracing possible effects of legislative proposals, new technologies or other water actions and programs which may pre-ordain a whole lifestyle change in the region. Three clusters of technology assessment methods are used to illustrate the usefulness of this approach, namely descriptive (e.g., dynamic modeling and cross-impact matrices); predictive (such as trend extrapolation and correlation); and, prescriptive (including Delphi, decision trees and scenarios). Finally, the approach also emphasizes the socio-political character within which judgments of technology assessment as to potential or preferable futures can be made in order to reach balanced decisions concerning long-range impacts of water resources development.
W77-00527

FEDERAL WATER RESOURCES RESEARCH PROGRAM FOR 1973 AND 1974, COMMITTEE ON WATER RESOURCES RESEARCH OF THE FEDERAL COUNCIL FOR SCIENCE AND TECHNOLOGY, (1976).
For primary bibliographic entry see Field 9D.
W77-00531

SYSTEMATIC APPROACH TO WATER RESOURCES PLAN FORMULATION.
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-00532

ROLE OF PARTIAL GRADIENT ESTIMATION BY SIMULATION IN WATER RESOURCE PLAN FORMULATION, PART I,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-00533

A SEARCH TECHNIQUE FOR FORMULATING IMPROVED WATER RESOURCES CONFIGURATIONS, PART II,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-00534

SCREENING MODELS IN WATER RESOURCES PLANNING, PART III,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-00535

THE ECONOMIC WATER SUPPLY IN IDAHO,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
W. C. Bailey, and R. B. Long.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-259 280, Price codes A02 in paper copy, A01 in microfiche. University of Idaho Agricultural Experiment Station, Research Bulletin No. 92, April 1976. 20 p, 8 fig, 9 tab, 17 ref. OWRT A-044-IDA(2). 14-34-0001-5012.

Descriptors: Costs, Economics, *Cost analysis, Unit costs, *Economies of scale, *Regression analysis, Least squares method, *Water supply, Supply, *Elasticity of supply, Prices, *Idaho, Municipal water, Irrigation water, Industrial water.
Identifiers: Supply curve.

Costs involved in making water available for use in Idaho were examined. Making the quantity of water available where needed involves costs for capturing, transporting, and distributing the water supply from existing sources. In examing the cost for making water available for use in Idaho, the water supply industry was segmented into three categories: municipal, industrial, and irrigation. Primary and secondary sources were used in the collection of the data from these three categories. Least squares regression analysis was performed on the data to estimate the relationship between total, fixed and variable costs, and water output for each category. The results of the regression analysis showed there is a reasonably high correlation, 0.70 to 0.81, between cost and output. The economic interpretation of the regression results indicated the water industry in Idaho is in Stage I of a standard production function and subject to economics of scale. In other words, costs of producing water tend to fall as output increases. Supply curves for these water categories were shown to be downward sloping and highly elastic. Results indicated sufficient water is available in Idaho to meet present and foreseeable needs. If past experiences can be used to predict the future, increased demands for water in Idaho can be met by further natural resource development.
W77-00538

ENERGY, WATER, AND THE WEST,
American Association for the Advancement of Science, Washington, D. C.
For primary bibliographic entry see Field 6D.
W77-00542

WATER RESOURCES IN THE WESTERN STATES: PROGRAM POLICY INITIATIVES.
For primary bibliographic entry see Field 6D.
W77-00547

THE PARTICIPATION OF NEW YORK COMMUNITIES IN THE FEDERAL FLOOD INSURANCE PROGRAM,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Rural Sociology.
For primary bibliographic entry see Field 6F.
W77-00671

ECONOMIC AND WATER USE IMPACTS ASSOCIATED WITH ALTERNATIVE WATER PRICING POLICIES OF ESTABLISHED IRRIGATION DISTRICTS,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6C.
W77-00672

NEW TECHNIQUES FOR POLICY EVALUATION IN ECOLOGICAL SYSTEMS: METHODOLOGY FOR A CASE STUDY OF PACIFIC SALMON FISHERIES,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
R. M. Peterman.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 11, p. 2179-2188, 1975. 5 fig., 16 ref.

Descriptors: *Decision making, *Methodology, *Optimization, *Graphical methods, Ecosystems, *Canada, Management, Alternative planning.
Identifiers: *Nomogram technique, Pacific salmon fishery, *Skeena River(British Columbia).

The nomogram technique to help decision-makers evaluate the relative merits of policy options is described and applied to a salmon management problem. The nomograms provide an instant review of information relevant for making a decision--in effect they are a graphical information retrieval system. They demonstrate certain limits to the ecosystem, allow experimentation with alternative plans merely by moving the plastic overlay with its pointers, and can include constraints on management imposed by desired maximum or minimum limits. In applying this decision-making method to the Skeena River (British Columbia) Pacific salmon fishery, other functions of the nomograms emerged: (1) Trade-offs between components of objectives or goals become readily apparent; (2) the steepnesses of the slopes on the surfaces indicate the degree of deviation from the optimal management policies if they are not exactly achieved; (3) individual value judgments and biases can be used to distinguish relevant impact indicators and their relative importance; (4) measures of resiliency or ability to cope with unexpected changes in the ecosystem can be included; (5) different nomogram surfaces can be combined into one composite either by mathematical weighing and summing or by using plastic overlays. The user can explore the changes in optimum policies caused by using different impact indicators with different weightings, and can assume different economic conditions. (Auen-Wisconsin)
W77-00702

A REGIONAL PLANNING APPROACH TO THE FLOODPLAIN MANAGEMENT PROBLEM,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W77-00704

THE THEORY OF WELFARE COST MEASUREMENT,
Minnesota Univ., Minn. Dept. of Economics.
J. C. Hause.
Journal of Political Economy, Vol. 83, No. 6, p. 1145-1182, 1975. 2 fig., 2 tab., 55 ref.

Descriptors: *Econometrics, *Welfare(Economics), *Theoretical analysis, Social aspects, Measurement, Estimating.
Identifiers: *Welfare change measurement, Preferences.

Economists have not yet arrived at a consensus about the history, theory and application of welfare cost measurement as based on consumers' surplus concepts, although such measurements are widely used in empirical studies such as those developed for pollution control. In an effort to bridge this theoretical gap, this study attempts to clarify the conceptual framework underlying welfare change measurements. Elements include: (1) welfare change measurements for an individual with known, consistent preferences; (2) estimation of welfare change measures from an individual's demand functions; (3) welfare change measurement for a group of individuals; and (4) measurement of intertemporal welfare change with and without distinct commodities as part of the consumption bundle. To better illustrate key ideas the theoretical work, use is made of comparis for alternative consumption opportunities avai ble to an individual with consistent preferenc No normative conclusions are intended as t work focuses on conceptual characterization net positive (or negative) compensation that wo required by one or more individuals with c sistent preferences to make one situation utili equivalent to another. (Harris-Wisconsin)
W77-00709

VALUE OF TIME IN RECREATION BENEF STUDIES,
Cornell Univ., Ithaca, N.Y.
F. J. Cesario.
Land Economics, Vol. 52, No. 1, p. 32-41, 1976 tab., 37 ref.

Descriptors: *Travel time, *Evaluati *Estimated benefits, *Recreation, *Theoreti analysis, Costs, Use rates, Parks, Recreati facilities, Transportation, Northeast U.S.

In studies made to assess primary econo benefits of outdoor recreation, estimation is creasingly made on the basis of consumers' s plus. But because recreation services are free o negligible prices, demand curves must be impu from limited price/quantity information. T Hotelling-Clawson-Knetsch method (HCK, travel-cost technique) is customarily used to pute such recreation site demand curves. Bu fundamentalal problem with HCK analysis is difficulty of fixing the value that consumers recreation services place on the travel time nec sary to reach them. To overcome this problem theoretical model of travel-time valuation developed in which the value of time with resp to nonwork travel was between 1/4 and 1/2 wage rate. The model was empirically tested outdoor recreation use data from 11 state park the northeastern United States. Benefit estima were generated under three assumptions: (1) ign ing travel time; (2) using an ad hoc methodol previously developed by Cesario and Knets and (3) valuing travel time according to the new developed model. Results showed that benefit e mates from the Cesario model substantially ceeded estimates made when travel time ignored but were substantially lower than th produced by the ad hoc Cesario-Knetsch meth Further refinements are sought through contin application of the model to empirical studi (Harris-Wisconsin)
W77-00710

WORKSHOP PROCEEDINGS: CITIZEN PA TICIPATION IN WATER RESOURCES DE SION-MAKING,
Massachusetts Univ., Amherst. Water Resour Research Center.
M. Ertel, and B. Lawson.
Available from the National Technical Infor tion Service, Springfield, Va 22161 as PB-259 6 $4.50 in paper copy, $3.00 in microfiche. WR Pub. No. 76, Special Report, August 1976, 47 OWRT B-036-MASS(2), 14-31-0001-4093.

Descriptors: *Social participation, *Conferenc *Attitudes, Water resources, *Decision-maki *Simulation analysis, Coasts, Water mana ment(Applied).
Identifiers: Gaming simulation, *Citizen partici tion, *Coastal zone management.

The Water Resources Research Center of University of Massachusetts has suppor through the Office of Water Research Technology a four-year study of citizen partici tion in water resources decision-making. One ment of this study has supported a workshop citizen participation focusing on program issues coastal zone management. This proceedings of workshop includes (1) the workshop announ ment, (2) the workshop materials with opening

rks and gaming-simulation guidelines, (3) luation report, and (4) list of participants.
7-00730

TERNATIVE FUTURES FOR ENVIRON-NTAL POLICY PLANNING: 1975 - 2000,
nford Research Inst., Menlo Park, Calif.
nter for the Study of Social Policy.
r primary bibliographic entry see Field 5G.
7-00768

NTRACTING FOR SOCIAL IMPACT AS-SSMENT,
r primary bibliographic entry see Field 6G.
7-00771

REPORT TO THE NEW ENGLAND RIVER SIN COMMISSION ON OUTDOOR RECREA-ON WITH APPLICATION TO THE SUPPLE-NTAL FLOOD MANAGEMENT STUDY OF E COMPREHENSIVE WATER AND RE-TED LAND RESOURCES INVESTIGATION THE CONNECTICUT RIVER BASIN. PART RECREATION,
reau of Outdoor Recreation, Philadelphia, Pa.
rtheast Regional Office.
R. Speers.
ailable from the National Technical Informa-n Service, Springfield, VA 22161 as PB-246 004,
ce codes: A05 in paper copy, A01 in microfiche.
epared for the New ENgland River Basins Com-ssion, March 1974. 78 p, 15 fig, 3 plates, 9 tab, ref, append. CRS-NERBC-BOR 1.6B (1.1).
S-NERBC-BOR 1.6B (1.1).

scriptors: *Recreation, *Reservoirs, *Access ites, *Connecticut River, *Recreation demand, ecreation facilities, *Reservoir operation, ater allocation(Policy), Water quality, Water orts.
ntifiers: *New England River Basins Commis-n, Statewide Comprehensive Outdoor Recrea-n Plan(SCORP), Wild and scenic rivers, Flat-ter recreation resource, Flowing water recrea-n resource.

1972 the New England River Basins Commis-n (NERBC) requested that the Northeast Re-n of the Bureau of Outdoor Recreation par-ipate in the Supplemental Study of the Water d Land Related Resources of the Connecticut ver Basin. The report discusses supply and de-nd for selected recreation activities in 1980, 0 and 2020; and suitability of recreation on od plain lands; identifies outdoor recreation pri-ties; summarizes inventories of natural and n-made lakes of 100 acres or more; compares sting demand for and access to boating oppor-ities and future demand and access to boating; d summarizes recreation streamflow benefits alysis. Recommendations are: local plans veloped by Statewide Comprehensive Outdoor creation Plans (SCORPs) be accepted and sup-rted; basin states, through their SCORPs con-ue to provide access and recreation facilities on water bodies of the Connecticut River Basin; ntinue studies to identify primary and secondary wnstream uses and the effects of controlled ease flow on ecology of these streams; optimum reation potential should be considered when nning for flood plains, local protective works d new impoundments; recreation potential of sting water resource developments should be ntinually examined to insure maximum use. commended priorities are: improve water quali-throughout the basin with emphasis on the main m of the Connecticut River; improve public ac-s to the basins' water; develop water resources ponsive to urban pressures; recognize recrea-n needs at hydro-electric power developments. entry-North Carolina)
7-00772

GUIDE PLAN REPORT, ANDROSCOGGIN RIVER BASIN, MAINE AND NEW HAMPSHIRE, REGIONAL AND INTERSTATE OVERVIEW.
New England River Basins Commission, Boston, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 613, Price codes: A05 in paper copy, A01 in microfiche.
Prepared for Maine State Planning Office, Draft report NERBC-26, May 1974. 80 p, 16 fig, 5 tab.

Descriptors: *Environmental control, *Environmental effects, *Flood protection, Dams, *Planning, *Water quality, *Flood control, *Decision-making, Flood plains, Fish management, Wildlife management, Recreation, Flood insurance, Land use.
Identifiers: *Androscoggin River Basin(ME-NH), Northern States Guide Plan, North Atlantic Regional Water Resources Study, Lake Umbagog region.

An overview of natural resource issues, problems and opportunities in the Androscoggin River Basin is presented with recommended program priorities to meet these problems. The Northern States Guide Plan program was begun in January 1972. Issues were analyzed in light of the Corps of Engineers' 1972 North Atlantic Regional Water Resources framework study which concluded that the management of the basin reflect its high environmental quality and remoteness. Conclusions referred to: characteristics of the basin influencing the use of water and related land uses; regional and interstate aspects of power, critical environmental areas, recreation, flood damage reduction, and water quality. The status of ongoing water and related land resources data collection, analysis and planning programs is described. Recommendations included: the Oquossoc No. 1 pumped storage power site in ME should not be developed for other uses until New England peak power needs are analyzed; minimum flow requirements and wild and scenic sections should be considered when evaluating potential power sites; alternative means of resource allocation necessary to properly manage the basin's critical areas (especially the Lake Umbagog region) should be investigated; studies should be made of the infrastructure needs, fish and wildlife management program needs, potential resource use conflicts and project priorities in recreation areas; land use controls should be adopted where they do not already exist; requirements should be met for HUD's flood insurance program; the importance of natural streamflow regulation in a basinwide flood damage reduction program should be evaluated. (Gentry-North Carolina)
W77-00774

REGULATION OF COASTAL ZONE DEVELOPMENT FOR FISHERIES MANAGEMENT,
Alabama Dept. of Conservation and Natural Resources, Montgomery.
H. A. Swingle.
Completion Report, June 1976. 21 p, 1 fig, 2 tab. Proj. No. 2-207-R.

Descriptors: *Fish management, *Permits, *Coasts, Fisheries, Marinas, *Alabama, Resources, Management, Sampling, Biology, Environment, Water resources, *Resources development, Wetlands.
Identifiers: Coastal waters, Fisheries management, *Coastal zone development, Environmental protection, East Fowl River(Ala), Heron Bay-Lafitte Bay(Ala).

A summary of activities completed on the federal aid project on regulation of coastal zone development for fisheries management is given. Permit evaluation and guidelines for permit applications are described. Summaries are given of the guidelines for construction in wetlands and coastal waters, specific project guidelines and biological sampling in East Fowl River and Heron Bay - Lafitte Bay. (NOAA)
W77-00891

THE SOCIAL AND ECONOMIC IMPORTANCE OF THE CARONI SWAMP IN TRINIDAD AND TOBAGO,
Michigan Univ., Ann Arbor. Dept. of Natural Resources.
For primary bibliographic entry see Field 6G.
W77-00893

THE SHRIMP FISHERY OF THE SOUTH ATLANTIC UNITED STATES: A REGIONAL MANAGEMENT PLAN.
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Center.
South Carolina Marine Resources Center, Charleston, Technical Report No. 8, June 1975. 73 p. 5 fig., 2 tab, 10 ref. Edited by P. J. Eldridge and S. A. Goldstein. NOAA 03-3-042-29.

Descriptors: *Commercial shellfish, *Shrimp, *Management, South Carolina, North Carolina, Georgia, Florida, Coordination , Costs, *Planning, *Southeast US, *Regional analysis, Atlantic Ocean.
Identifiers: *Regional management, South Atlantic coast.

In order to provide maximum sustained benefits for the region, the proposed shrimp management plan is oriented to the goals of sustaining the fishery so that the catch levels can be maintained at least at the average of the 1955-1970 period until 1980; to identify by 1978 the potential expansion of harvest by better utilization of existing species and exploiting underutilized species; to establish economic criteria by 1978 for evaluating and initiating management action based on social parameters. The core of the plan is a regional catch and effort statistics program which would provide for collection of economic and biological data. This statistical program should have the capability of being expanded to include other fisheries. The principal advantage of this new system is that the management will coincide with the geographical distribution of the shrimp resource. The basic organizational structure of the management system is illustrated and is headed by a Management Council which will set regional policy. Technical Committees with supporting groups would be appointed as necessary. Recommendations for the consideration of the Management Council are listed in the order of priorities. The costs of the management plan are estimated to be approximately $3 million for each five year period. (Auen-Wisconsin)
W77-00918

OPTIMIZING BENEFITS TO URBAN RESIDENTS OF A TOTAL FLOOD WARNING SYSTEM FOR THE BRISBANE VALLEY (AUSTRALIA),
Bureau of Meteorology, Brisbane (Australia). Hydrometeorology Section.
For primary bibliographic entry see Field 4A.
W77-00944

BENEFIT-COST STUDIES IN THE PAHANG RIVER BASIN STUDY (MALAYSIA),
For primary bibliographic entry see Field 4A.
W77-00947

A PLAN FOR MICHIGAN'S SHORELANDS.
Michigan Dept. of Natural Resources, Lansing.
1973. 135 p, 29 fig, 64 photo, 17 tab, 10 ref, 4 append.

Descriptors: *Michigan, *Lake shores, *Erosion control, *Great Lakes Region, *Long-term planning, Analyticial techniques, Evaluation, Flood control, Land management, Shores, Decision making, Forecasting, Environmental effects, Shore protection, Beach erosion, Water law,

Water policy, Regulation, Control, Conservation, Management, Administration, Legislation.
Identifiers: Shoreland planning, Shoreland management.

Pursuant to the Shorelands Protection and Management Act of 1970, the Michigan Department of Natural Resources has developed a broad management program for the use and protection of state shorelands. This program has had to integrate many factors. Examined here are the following: (1) the character of state shorelands; (2) shore erosion and flooding; (3) environmental areas of concern; (4) general shoreland problems; (5) management guidelines; (6) existing regulatory shoreland management techniques; and (7) state and federal shoreland programs. Through numerous photographs and charts, this booklet illustrates the variety of shore problems it is hoped the plan will alleviate or solve. (Reinders-Florida)
W77-00958

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE ECONOMIC WATER SUPPLY IN IDAHO,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-00538

RELATION OF OPERATION AND MAINTENANCE TO TREATMENT PLANT EFFICIENCY,
Environmental Protection Agency, Washington, D.C. Municipal Operations Branch.
For primary bibliographic entry see Field 5D.
W77-00582

ECONOMICS OF A FREEZE DESALTING PROCESS USING COLD SEAWATER EFFLUENT OF A LIQUID NATURAL GAS PLANT.
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W77-00635

ECONOMIC AND WATER USE IMPACTS ASSOCIATED WITH ALTERNATIVE WATER PRICING POLICIES OF ESTABLISHED IRRIGATION DISTRICTS,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
W. E. Schmisseur.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 559, Price codes: A05 in paper copy, A01 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-47, September 1976. 78 p, 40 tab, 13 ref, append. OWRT A-022-ORE(1).

Descriptors: *Linear Programming, *Irrigation districts, *Pricing, Irrigation, Sprinkler irrigation, *Alternative costs, Model studies, *Oregon, Water policy, *Alternative water use, *Economic impact, *Water costs.
Identifiers: *Responsive pricing(Irrigation).

A linear programming model of two diverse, operating irrigation districts in Oregon is used to identify technical and economic effects attributed to fixed cost, base allotment, and responsive water pricing. From this district specific analysis general guidelines are developed relative to water pricing policies and their impacts. Water diversion and peak use were greater with fixed cost pricing than with either base allotment or responsive pricing. For base water allotment pricing to be effective in rationing water use however, the base allotment should be set at a level where variable charges come into play and these charges must be high enough to moderate water use. Relative to fixed cost pricing water costs were appreciably increased and crop returns were reduced with either base allotment or responsive water pricing. With either of these pricing schemes, the highest water cost and greatest reduction in crop returns on an irrigated acre basis were borne by the less water and yield efficient farms. Relative to base allotment pricing, net water revenues of the district were greater with responsive pricing. The smallest range in water cost either on an irrigated acre or acre foot basis occurred with responsive pricing. The smallest range in water cost either on an irrigated acre or acre foot basis occurred with responsive pricing.
W77-00672

GROWN ORGANIC MATTER AS A FUEL RAW MATERIAL RESOURCE,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 3F.
W77-00700

HOUSING DEVELOPMENT CANALS IN THE COASTAL ZONE OF THE GULF OF MEXICO: ECOLOGICAL CONSEQUENCES, REGULATIONS, AND RECOMMENDATIONS,
National Marine Fisheries Service, St. Petersburg, Fla. Environmental Assessment Div.
For primary bibliographic entry see Field 6G.
W77-00701

NEW TECHNIQUES FOR POLICY EVALUATION IN ECOLOGICAL SYSTEMS: METHODOLOGY FOR A CASE STUDY OF PACIFIC SALMON FISHERIES,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
For primary bibliographic entry see Field 6B.
W77-00702

INTERNATIONAL JOINT VENTURES IN FISHING AND 200-MILE ECONOMIC ZONES,
British Columbia Univ., Vancouver. Div. of International Business Studies.
For primary bibliographic entry see Field 6E.
W77-00707

USE PATTERNS FOR DEPLETABLE AND RECYCLEABLE RESOURCES,
John F. Kennedy School of Government, Cambridge, Mass.
M. C. Weinstein, and R. J. Zeckhauser.
In: 1974 Symposium 'On The Economics of Exhaustible Resources' sponsored by the Review of Economic Studies, p. 67-78. 5 fig., 15 ref.

Descriptors: *Recycling, *Economic efficiency, Model studies, Market value, Interest rates, Resources development, Marginal costs, Optimization, Prices, Mathematical models, Costs.
Identifiers: *Depletable resources.

The question of whether market forces can bring about an optimal amount of recycling is addressed, using a simplified multi-stage model of resources such as iron, aluminum and various heavy metals, which are in limited supply. First a variety of models are examined to see how the significant presence of depletable resources would affect market interest rates. It is concluded these cases can be generalized to the case where interest rates are determined endogenously. Second, several models of markets for recycleable resources are analyzed. These include the following cases: nondepletable resources with zero recycling cost, partially depletable resources with zero recycling cost, recycleable resources with zero extraction costs, recycleable resources with constant marginal extraction costs, and recycleable resources with increasing marginal extraction costs. In the most general case, extraction costs increased with the amount extracted. After an initial period of extraction, a period of coexistence of recycling an extraction activities occured similiar to that o present and projected situations. Capital marke and information were assumed to be perfect an storage costs to suppliers were assumed to be zer in all cases. It is shown in every case that the s cially optimal time stream of consumption identical to the stream produced by perfectly com petitive markets. (Luedtke-Wisconsin)
W77-00708

THE THEORY OF WELFARE COST MEA SUREMENT,
Minnesota Univ., Minn. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W77-00709

VALUE OF TIME IN RECREATION BENEFI STUDIES,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6B.
W77-00710

HARVESTING THE OCEAN--ON LAND,
Alexander Marine Research Facility, Cayuco Calif.
For primary bibliographic entry see Field 5G.
W77-00718

A SYSTEMS APPROACH TO THE ECONOMI OF WASTE HANDLING,
Aston Univ., Birmingham (England). Dept. Chemical Engineering.
For primary bibliographic entry see Field 5D.
W77-00745

COMPARATIVE COSTS OF EROSION AN SEDIMENTATION CONTROL MEASURES,
Irrigation/Agriculture Engineering-Science, In Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W77-00794

OPTIMAL EXPLOITATION OF MULTIP STOCKS BY A COMMON FISHERY: A NE METHODOLOGY,
British Columbia Univ., Vancouver. Inst. Animal Resource Ecology.
For primary bibliographic entry see Field 6A.
W77-00920

ENVIRONMENTAL PROTECTION AND SE TIAL ALLOCATION OF INVESTMENTS,
Erasmus Univ., Rotterdam (Netherlands).
For primary bibliographic entry see Field 6G.
W77-00922

AN ECONOMIC ANALYSIS OF THE ENVIRO MENTAL IMPACT OF HIGHWAY DEICING,
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5C.
W77-00923

A STAGE-DAMAGE CURVE FOR T BRISBANE RIVER (AUSTRALIA),
Snowy Mountains Engineering Corp., Coo (Australia).
For primary bibliographic entry see Field 4A.
W77-00943

6D. Water Demand

ISSUES RELATED TO INTERFACING WAT RESOURCE PLANNING WITH LAND U PLANNING: DEVELOPMENT AND APPLIC TION OF QUANTITATIVE PROCEDURES,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.

7-00526

CHNOLOGY ASSESSMENT FOR NEW TER DEVELOPMENT PROJECTS, LUME I),
odyne Corp., Littleton, Colo.
primary bibliographic entry see Field 6B.
7-00527

E ECONOMIC WATER SUPPLY IN IDAHO,
ho Univ., Moscow. Dept. of Agricultural nomics.
primary bibliographic entry see Field 6B.
7-00538

ERGY, WATER, AND THE WEST,
erican Association for the Advancement of nce, Washington, D. C.
ilable from the National Conference of State islatures, Ofc. of Science and Technology, ver, Colo. for $5.00 in paper copy, $3.00 in rofiche. A Workshop Focusing on the Impact Energy Development on Western Water ources, November 2-5, 1975, in Albuquerque, v Mexico. Published May 1976, 87 p. Edited by . Gillette, AAAS Publication 76-R-2.

criptors: *Energy, *Water demand, *Water urces development, Economic impact, Adistrative agencies, Planning, Water manage-t(Applied), Water importing, Water transfer, er utilization, Costs, Legal aspects, Water ply, Industrial water, *Water requirements, ure planning(Projected).
ntifiers: *Western U. S., *Energy requirets.

workshop was developed to inform state slators of the probable impacts of western rgy development on western water resources, facilitate a dialogue between the state polnakers and those principals within the federal ncies that would be formulating the federal grams in this area, to engender effective intate dialogue, and to determine the extent of wledge among the western policymakers of the act that growing energy development would e on present water management programs. A ying thread in the conference was that the im- of energy development on western water urce is one, if not the most important, factor nergy development and, though it appears that er is available in the western states, it is not in right place, and in order to be in the right place e right time, the states and the federal governt must cooperatively develop effective policy programs. The papers and discussion summadefine some of the problems, offer partial tions and should prove beneficial reading to state policymaker.(See W77-00543 thru W77-39)
7-00542

E IMPACT OF PROPOSED FEDERAL ENER- DEVELOPMENT ON WESTERN WATER OURCES,
primary bibliographic entry see Field 4C.
7-00543

DERAL AND STATE GOVERNMENTS, AND E INDIAN NATIONS: WATER RIGHTS, NFLICTS, AND POLICIES,
primary bibliographic entry see Field 6E.
7-00544

RICULTURAL AND ENVIRONMENTAL IMCTS AS A RESULT OF INCREASED DENDS FOR ENERGY DEVELOPMENT,
Energy, Water, and the West, November 2-5, 5, Albuquerque, p 37-43, May 1976. 5 append.

Descriptors: *Rehabilitation, *Environmental engineering, *Energy, *Land management, *Food and cover crops, Agriculture, Food abundance, Coals, Oil shales, Water utilization, Impoundments.
Identifiers: *Extractive use.

Water will be needed for all phases of energy development in western states, including rehabilitation of the areas mainly requires establishing and maintaining native vegetation, while oil shale areas have the problem of salt management. Water is not expected to be a limiting factor in either process. Other significant environmental changes associated with energy development are more significant; these include impoundment, reallocation and extractive use with streams and water supplies. The possible effects of such changes are described, including those on agriculture, livestock and wildlife patterns, and salt buildup with extractive use. The role of energy in the world's food and fiber ecosystems is analyzed. The need for increased food production places greater demands on the already limited water resources in the West. (See also W77-00542) (Jahns-Arizona)
W77-00545

WATER RESOURCE AUGMENTATION IN THE SOUTHWEST.
For primary bibliographic entry see Field 3B.
W77-00546

WATER RESOURCES IN THE WESTERN STATES: PROGRAM POLICY INITIATIVES.
In: Energy, Water, and the West, November 2-5, 1975, Albuquerque, p 55-63, May 1976. 5 append.

Descriptors: *Water resources development, *Water requirements, *Planning, *Water management(Applied), *Water importing, Texas, Colorado, Wyoming, New Mexico, Colorado River Compact, Legal aspects, Water supply, Water demand, Energy, Water transfer, Costs.
Identifiers: Trans-Texas Canal System, Western US.

Water resources planning in Texas, Colorado, Wyoming and New Mexico is discussed by representatives from those states. The Texas Water Plan assumes the state will be water-deficient within the next 50 years and projects importation of 8 to 10 million acre-feet a year using the Trans-Texas Canal System to carry water from the East. Water transported by the canal to Texas and New Mexico would be used mainly for agricultural purposes. Wyoming water laws and interstate compacts are discussed and the Wyoming Water Planning Program outlined. In Colorado, a study by the University of Denver Research Institute analyzes ten methods for reducing or eliminating the water supply/demand gap, including transmountain diversion, construction of new storage facilities, use of groundwater, weather modification and wastewater reuse. The study also presents a methodology for integrating information about additional water needs with techniques available and emphasizes the total cost of each alternative, including indirect economic effects, interest subsidies, social and environmental impacts and legal aspects. Some of these effects are discussed. Water requirements for energy production in New Mexico may constitute 5 to 10% of total projected water needs by 2020. Effects from the Colorado River Compacts are analyzed, along with possible impacts of energy production water use in the state. (See also W77-00542) (Jahns-Arizona)
W77-00547

VIEWS FROM THE ENERGY INDUSTRIES.
In: Energy, Water, and the West, November 2-5, 1975, Albuquerque, p 67-70, May 1976. 5 append.

Descriptors: *Energy, *Industries, *Industrial(Water), *Coals, *Oil shales, *Slurries, Water requirements, Economic feasibility, Colorado, Wyoming, Planning, Water allocation(Policy), Pipelines.
Identifiers: Western U.S., Trans-Texas Canal System, Montezuma Pump-Back Storage Project.

A projected slurry pipeline from Gillette, Wyoming to White Bluff, Arkansas is expected to carry 25 million tons of coal each year starting in 1985. Slurry manufacture is described and its water use and energy-saving features analyzed. In a minemouth power plant built in Wyoming, seven times as much water would be evaporated as a slurry pipeline needs for the same amount of coal. Such pipelines use about 15,000 acre-feet of water a year or 20.7 cubic feet per second. Water requirements are substantial for both coal gasification and oil shale development. Many potential coal gasification projects in the West are still seeking a viable water supply. Oil shale developers in Colorado have filed for over 800,000 acre-feet of water in the Colorado and White Rivers; several with senior rights are building conversion works and planning storage reservoir construction. A reliable water source is required before projects will proceed. Issues of public policy must be resolved first on water allocation, interbasin conflicts, water quality, withdrawals for wild and scenic rivers and other problems. The Trans-Texas Canal System and development of the Montezuma Pump-Back storage project (Arizona) are also discussed. (See also W77-00542) (Jahns-Arizona)
W77-00548

NONWATER-INTENSIVE ENERGY RESOURCES.
In: Energy, Water, and the West, November 2-5, 1975, Albuquerque, p 73-76, May 1976. 5 append.

Descriptors: *Water requirements, *Energy, *Electric powerplants, Economic feasibility, Hydrothermal studies, Geothermal studies, Solar radiation, Wind pressure, Winds, Cooling, Energy conversion, Water demand.

Water requirements for solar energy production are analyzed and compared with water consumption patterns for other fossil fuel types of electricity generation. Possible techniques include the use of mirrored surfaces and the photovoltaic approach where sunlight is converted directly to electricity using solar cells, the latter requiring no water. Economic feasibility and possible refinements of the solar cell are discussed. Wind generation is another solar-energy prospect with no water requirement. Geothermal energy has been used commercially only under geologic conditions where heat from the Earth's interior is transported to the surface by convective circulation of steam or very hot water. Natural hydrothermal systems may produce dry steam or, more often, superheated water which contains great quantities of thermal energy. Dry hot rock energy utilization is discussed as a system which may improve as energy is withdrawn from it. More air-cooled power plants may also be developed in the future. (See also W77-00542) (Jahns-Arizona)
W77-00549

A REPORT TO THE NEW ENGLAND RIVER BASIN COMMISSION ON OUTDOOR RECREATION WITH APPLICATION TO THE SUPPLEMENTAL FLOOD MANAGEMENT STUDY OF THE COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION OF THE CONNECTICUT RIVER BASIN. PART V. RECREATION,
Bureau of Outdoor Recreation, Philadelphia, Pa. Northeast Regional Office.
For primary bibliographic entry see Field 6B.
W77-00772

GEOHYDROLOGY AND WATER SUPPLY, SHEYMA ISLAND, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.

W77-00851

AVAILABILITY OF GROUND WATER IN THE AREA SURROUNDING THE TRIDENT SUBMARINE CONSTRUCTION FACILITY, KITSAP COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4B.
W77-00862

6E. Water Law and Institutions

THE IMPACT OF PROPOSED FEDERAL ENERGY DEVELOPMENT ON WESTERN WATER RESOURCES,
For primary bibliographic entry see Field 4C.
W77-00543

FEDERAL AND STATE GOVERNMENTS, AND THE INDIAN NATIONS: WATER RIGHTS, CONFLICTS, AND POLICIES,
In: Energy, Water, and the West, November 2-5, 1975, Albuquerque, p 21-34, May 1976. 5 append.

Descriptors: *Federal government, *State governments, *Indian reservations, *Federal-state water rights conflicts, *Water rights, Governmental interrelations, Water resources development, Water policy, Constraints, Jurisdiction, Land management, Energy, Planning.
Identifiers: *Western U.S.

The authority over water rights and water use policies belongs chiefly to the states, but federal government control and influence is increasing. State jurisdiction, interstate policy conflicts, and federal laws which affect surface water resources are discussed. The Bureau of Land Management has generally been concerned with small water developments for livestock, wildlife and watershed purposes, but its role has shifted somewhat toward general management of water resources in cooperation with state officials. The priority in federal water programs is energy rather than other uses such as agriculture. The quantity of water under government control could greatly expand through reserved rights and overcome state policy priorities. Federal-state conflicts in water resource law are discussed, including the issue of Indian lands water jurisdiction. The Supreme Court has consistently ruled that the authority to secure water rights to Indian tribes is contained in the Constitution; lands reserved under these provisions are protected by the Supremacy Clause and not subject to impairment by the states. Indian management of land and water resources is discussed. Cooperative water planning between state, federal and Indian governments is considered crucial. (See also W77-00542) (Jahns-Arizona)
W77-00544

REGULATIONS: REACTIONS AND RESOLUTION,
Environmental Protection Agency, Washington, D. C., Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W77-00615

LIST OF PAPERS, 1967/1975, (INTERNATIONAL ASSOCIATION FOR HYDRAULIC RESEARCH).
International Association for Hydraulic Research, Delft (Netherlands).
For primary bibliographic entry see Field 10C.
W77-00636

PLANNING LEVEL AND PROGRAM IMPACT STATEMENTS UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT: A DEFINITIONAL APPROACH,
California Univ., Los Angeles. School of Law.
For primary bibliographic entry see Field 6G.
W77-00705

INTERNATIONAL JOINT VENTURES IN FISHING AND 200-MILE ECONOMIC ZONES,
British Columbia Univ., Vancouver. Div. of International Business Studies.
J. W. C. Tomlinson, and I. Vertinsky.
Jounral of the Fisheries Research Board of Canada, Vol. 32, No. 12, p. 2569-2579, 1975. 1 tab., 50 ref.

Descriptors: *Marine fisheries, *Jurisdiction, *Participating funds, *Investment, Exploitation, Decision making, Africa, South America, Industries, Foreign countries.
Identifiers: *Joint fishing ventures, 200-mile zones, Sovereign waters, Foreign investment.

Various strategies that may be adopted by coastal nations for utilization of fishery resources under a system of 200-mile economic zones are examined. The benefits and problems that are likely to arise out of alternative approaches, such as a do-nothing strategy, independent operation, licensing, foreign subsidiaries, and joint ventures are discussed. A form of joint venture has the greatest potential for success in achieving both effective utilization of resources and beneficial development of the underdeveloped coastal nations. Because of the inputs of resources, technology, and access to markets by the foreign partner, the joint operation not only generates revenues, but the costs of developing the fishery are more than covered, thus avoiding or reducing the need for development subsidies. A joint operation provides a prescribed control and indirectly creates externalities favorable to related and dependent activities. A necessary condition of joint participation is the inclusion of local technical and managerial personnel to generate a skilled base in the host country. For those coastal nations lacking effective domestic naval policing ability, the growth of a fishing fleet generates the growth of a merchant marine capability as the base for an operational naval force. The institutionalization of joint ventures in fishing would also serve as a foundation to resolve problems during exploitation of sea-bed mineral resources. (Auen-Wisconsin)
W77-00707

ENVIRONMENTAL MANAGEMENT IN THE MALIBU WATERSHED: INSTITUTIONAL FRAMEWORK,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 6G.
W77-00769

MARINE AND ESTUARINE SANCTUARIES. PROCEEDINGS OF THE NATIONAL WORKSHOP ON SANCTUARIES, 28-30 NOVEMBER 1975, WASHINGTON, D. C.,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W77-00888

REPORT TO THE CONGRESS ON OCEAN DUMPING RESEARCH, JANUARY THROUGH DECEMBER 1975.
National Oceanic and Atmospheric Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W77-00892

MARINE POLLUTION ARTICLES IN THE LAW OF THE SEA SINGLE INFORMAL NEGOTIATING TEXT,
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 5G.
W77-00894

WISCONSIN NATURAL RESOURCE USE CON TROLS AND ASSISTANCE.
Wisconsin Dept. of Natural Resources, Madison.
Publication No. 3-8800, 1975. 18 p, 14 tab.

Descriptors: *Administrative agencies *Regulation, *Water resources developmen *Land development, Law enforcement, Floo plain zoning, Permits, Water quality, Air poll tion, Potable water, Environment, Solid waste Forestry, Wildlife, Fisheries, Conservatio Recreation, Tourism, Industrial wastes.

The organizational structure--by divisions, b reaus, and sections--and the various functions the Wisconsin Department of Natural Resourc that may affect the construction of a land develo ment and/or water development project are liste The Division of Enforcement's duties are to pl and direct a coordinated program of law enforc ment encompassing all enforcement responsibi ties with regard to the environment, fish and gam violations, water management, zoning matters, pollution control and solid waste managemen park and recreation areas, and forestry. The Di sion of Environmental Standards is responsible f establishing and enforcing standards which are i tended to maintain and improve the quality of a land, and water of the state. The Division Forestry, Wildlife and Recreation plans and coo dinates the development, protection and utiliz tion of forest, fish and game resources; other w plants and animals, other outdoor recreati resources and the wild rivers program. Charts f each division describe its function and legislati statute, authority requirement for a proposed co struction, whether a public hearing or pub notice is required, defines the applica (defendant), and prescribes the permit issuing fice (if required), and give information source (Auen-Wisconsin)
W77-00915

THE CANADA WATER ACT, ANNUAL R PORT, 1974-1975.
Department of the Environment, Otta (Ontario).
For primary bibliographic entry see Field 5G.
W77-00916

OPTIMAL TAXATION POLICIES FOR CO SERVATION AND RECYCLING,
Florida Univ., Gainesville. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-00921

FLOOD STANDARDS - THE ROLE OF E GINEERING INSTITUTIONS,
Binnie and Partners, Melbourne (Australia).
For primary bibliographic entry see Field 6F.
W77-00935

THE INTERNATIONAL LAW OF THE SEA: CASE FOR A CUSTOMARY APPROACH,
South Carolina Univ., Columbia. School of Mar Science.
E. W. S. Hull.
University of Rhode Island, Kingston, Law of Sea Institute, Occasional Paper No 30, April 19 17 p.

Descriptors: *Law of the Sea, *Governmental terrelations, *International waters, *Resour development, Military aspects, Navigati Foreign countries, Organizations, United Natio Resource allocation, Water law, Regulati Planning, International law, Oceans, Water poli Institutional constraints, Jurisdiction, C ferences, Treaties, Foreign waters, Legal aspe Federal government, Governments, Internatio commissions.
Identifiers: Coastal zone management, Territo seas(Jurisdiction).

spite nearly a decade of effort, progress wards agreement on a new Law of the Sea OS) Convention has been extremely slow. This per notes the diversity of perspectives among e participants, describes the basic issues, and ggests policy changes for the United States. The sdom of a purely conventional approach to the velopment of a new LOS is examined. It is sug-sted that a totally different approach, one which pragmatic and has its origins in customary law, needed. While there are many alternative ap-oaches to initiation of customary LOS evolu-nary processes, several recommendations are ade to demonstrate a new policy approach, in-ding: (1) proclamation of a 12-mile territorial a for the U. S.; (2) proclamation of a 200-mile onomic zone; (3) recognition of the archipelago nciple; (4) enactment of enabling legislation to rmit the commencement of undersea mining erations; (5) declaration of a national policy op-sing the dumping of hazardous materials in the ean; and (6) the obtaining of maximum freedom scientific research. (Reinders-Florida)
77-00956

74 ANNUAL REPORT, (WASHINGTON ATURAL RESOURCES AND RECREATION GENCIES).
r primary bibliographic entry see Field 5G.
77-00957

PLAN FOR MICHIGAN'S SHORELANDS.
chigan Dept. of Natural Resources, Lansing.
r primary bibliographic entry see Field 6B.
77-00958

ONPOINT POLLUTION: AN EPA VIEW OF REAWIDE WATER QUALITY MANAGE-ENT,
vironmental Protection Agency, Washington, C. Water Planning Div.
r primary bibliographic entry see Field 5G.
77-00959

ONPOINT POLLUTION AND WATER QUALI-MONITORING,
orgia Univ., Athens. Inst. of Community and ea Development, and Georgia Univ., Athens. t. of Ecology.
r primary bibliographic entry see Field 5G.
77-00960

STITUTIONAL ARRANGEMENTS FOR KE MANAGEMENT IN WISCONSIN,
sconsin Univ., Madison. Environmental sources Unit.
Klessig.
rnal of Soil and Wa. r Conservation, Vol 31, 4, p 152-55, July-August 1976. 4 p, 1 photo, 1 rt, 16 ref.

scriptors: *Water management(Applied), isconsin, *Lakes, *Local governments, eservoirs, State governments, Legal aspects, itical aspects, Water resources, Water ources development, Zoning, Natural ources, Water supply, Water requirements, ter utilization, Water control, Legislation, nts.
ntifiers: *FWPCA Amendments of 1972, land Lake Demonstration Project.

kes and reservoirs are a major public resource. such, they require active management by a able legal authority. In some regions, federal or e agencies may best be able to assume the lead e. In regions with many lakes, a local unit may more appropriate. Through recent legislation, sconsin has provided a mechanism by which lo-ties can become responsible for their own es. Chapter 33 of the Wisconsin Statutes is the bling authority for such local control. Under apter 33, the state and federal governments will provide funds for such localities for lake and reservoir management. Furthermore, because of the state program, Wisconsin has managed to obtain a large share of federal allotment under the FWPCA Amendments of 1972. Chapter 33 became reality through the work of the Inland Lake Demonstration Project, which spent years educating the people of the state as to the need for such legislation. Hopefully other states will follow Wisconsin's lead. (Frank-Florida)
W77-00966

NEW FEDERAL REGULATIONS FOR DREDGED AND FILL MATERIAL,
Smith (David D.) and Associates, San Diego, Calif.
For primary bibliographic entry see Field 5G.
W77-00967

MODEL FOR A STUDY,
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 2L.
W77-00971

PAYING TO POLLUTE.
For primary bibliographic entry see Field 5G.
W77-00972

PIANC,
National Water Resources Association, Washington, D. C.
C. H. Bronn.
Water Spectrum, Vol 7, No 4, p 30-36 Winter 1975-76. 7 p, 3 map, 6 photo.

Descriptors: *Conferences, *International commissions, *Navigation, *Information exchange, Publications, Waves, Engineering structures, Docks, Coastal structures, Planning, Navigable waters, Ships, Dredging, Environmental effects, Water policy, Harbors, Locks, Maps, Multiple-purpose projects, Governments, Federal government, Legal aspects, International law.
Identifiers: Coastal zone management, Comparative law, Coastal waters.

Toward the close of the 19th century, when a number of governments agreed that common navigational interests merited an international exchange of ideas, the Permanent International Association of Navigation Congress (PIANC) was formed. This article explains the organization, functions, and goals of PIANC. PIANC affords high level professionals, chosen for their diversity of training and experience, an opportunity to meet and exchange technical and professional information among national policy makers. PIANC actions are directed by a Permanent International Commission (PIC) appointed by the member governments. The quadrennial congresses are preceded by the publication of professional papers on subjects selected by the PIC. Five PIANC commissions are currently at work in the following areas: sports and pleasure navigation; waves; reception of large ships; locks, ship lifts and river weirs; and environmental effects of dredging and the disposal of dredged materials. (Reinders-Florida)
W77-00976

THE SELLING OF THE SHELF,
For primary bibliographic entry see Field 5G.
W77-00979

CORPORATE RESPONSIBILITY IN SILVER BAY,
For primary bibliographic entry see Field 5G.
W77-00980

DECISION TO LEASE OUTER CONTINENTAL SHELF LANDS,
Massachusetts Energy Policy Office, Boston.
H. Lee.
Coastal Zone Management Journal, Vol 2, No 1, p 31-46 (1975). 16 p, 31 ref.

Descriptors: *Continental shelf, *Mineral industry, *Decision making, *Oil fields, *Long-term planning, Short-term planning, Oil spills, Oil wells, Oil industry, Oil, Natural gas, Leases, Bids, Exploration, Exploitation, Geologic formations, Geological surveys, Offshore platforms, Coasts.
Identifiers: *Coastal waters.

The piecemeal process by which the United States is developing its offshore resources can be improved by greater cohesion in planning and development procedures. Currently each resource is usually considered in isolation. For example, one group of policy makers will be concerned with oil, another with fishing, and a third with pollution. The author suggests that the decision to lease areas of the Outer Continental Shelf for purposes of oil exploration was principally determined by the form of the decision making process, rather than by a rational analysis of economic and political factors. The author favors a plan put forth by Senator Hollings of South Carolina, which would do away with the piecemeal approach of leasing tract by tract. Instead, percentage shares of entire geological structures would be leased. No joint bidding would be allowed. A party could bid up to 20% of the total interest in that structure. Bids would be awarded on the highest dollar value per one percent interest. Combined geologic studies would enable the coastal states to assess the impact of drilling on the basis of hard information. As a result coastal states would have the chance to establish management structures necessary to protect their existing economic and environmental resources. (Frank-Florida)
W77-00981

SHORELINE EROSION: IMPLICATIONS FOR PUBLIC RIGHTS AND PRIVATE OWNERSHIP,
P. Burka.
Coastal Zone Management Journal, Vol 1, No 2, p 175-195 (1974). 21 p, 93 ref.

Descriptors: *Public rights, *Erosion control, *Beach erosion, *Shore protection, *Public access, Public benefits, Public lands, High water mark, Erosion, Common law, Civil law, Easements, Prescriptive rights, Water law, Shores, Beaches, Legal aspects.

Public beach access rights and the erosion of the ocean shoreline have each been identified as major coastal zone problem areas. There is a close relationship between the two. Suggested here are certain concepts that should be universally adopted to make beach regulation more coherent and cohesive. Different states have different theories concerning public beach access rights. They range from public ownership from the mean high tide line all the way up to the vegetation line. Where erosion of the shoreline is concerned, there are problems in determining what actions one landowner may take to protect his beach since his actions may result in damage to an adjacent landowner. Some states say that one may protect one's land, but not at the expense of adjacent landowners. Others follow the Common Enemy doctrine, which allows greater latitude in protection even at another's expense. The erosion problem presents another question. Under what theory does the public have a right to prevent erosion, and to what land does the public have a right when erosion occurs. The author answers these questions by calling for the adoption of the concept of a 'rolling easement'. Any universal concept concerning beach law, however, is far from a reality. (Frank-Florida)
W77-00982

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT

LIMITATIONS, GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-00983

ENVIRONMENTAL PROTECTION AND ENHANCEMENT (GENERAL GUIDANCE TO ELEMENTS WITHIN THE DEPARTMENT OF THE ARMY ON ENVIRONMENTAL PROTECTION).
Office of the Cheif of Engineers (Army), Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-00984

OCEAN DUMPING; PROPOSED SITE DESIGNATION.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-00985

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-00986

TRAIN V COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. (CONFLICT OF FEDERAL WATER POLLUTION CONTROL ACT AND THE ATOMIC ENERGY ACT).
96 SCt 1938-49 (1976). 10 p.

Descriptors: *Radioactive wastes, *Water quality standards, *Jurisdiction, *Permits, *Federal Water Pollution Control Act, Navigable waters, Pollutants, Judicial decisions, Administrative agencies, Governmental interrelations, Nuclear powerplants, Radioisotopes, Nuclear wastes, Federal government, Regulation, Standards, Water pollution, Legislation.
Identifiers: Licenses.

Plaintiff organization brought suit to compel defendant federal agency to control the discharge into navigable waters of radioactive effluents from two nuclear power plants. Plaintiff contended that the defendant had a non-discretionary duty under the Federal Water Pollution Control Act (FWPCA) to control such discharge and that the defendant failed to perform said duty. The defendant asserted that the authority to regulate discharge of radioactive materials lay wholly with the Atomic Energy Commission (AEC). The trial court granted summary judgement for the defendant. The appellate court reversed. The Supreme Court of the United States held for the defendant, finding that the defendant's determination that source, by-product, and special nuclear materials were not 'pollutants' within the meaning of the FWPCA. The Court determined that the legislative intent was that the FWPCA permit program cover only those materials beyond AEC juristiction, such as radium and accelerator produced isotopes. The Court also determined that the AEC retains full authority to regulate materials covered by the Atomic Energy Act to the exclusion of any other agency. (Capehart-Florida)
W77-00987

UPPER NIOBRARA RIVER COMPACT.
Wyo Stat Ann secs 41-512.5 thru 41-512.6 (Supp 1971).

Descriptors: *Wyoming, *Interstate compacts, *Equitable apportionment, *Surface-groundwater relationship, *State governments, Surface waters, Groundwater, Nebraska, Data collections, Regulation, Governmental interrelations, Gaging stations, Reservoirs, Diversions, Surveys, Beneficial use, Interstate rivers, Irrigation, Surface water availability, Water supply, Water resources, Groundwater resources.
Identifiers: *Upper Niobrara River Compact(Wyo-Neb).

The Upper Niobrara River Compact, a compact between Wyoming and Nebraska, has been ratified by the state of Wyoming. The compact governs apportionment between the states of the surface water supply of the river basin. The compact specifies the limitations on use of surface waters to be imposed on Wyoming as the upstream state. It further provides for a study of the groundwater flow since use of groundwater in the basin may deplete the surface flow in the river. Apportionment of the groundwater maybe done later by supplementing the compact. If, as a result of the study, groundwater apportionment is not deemed necessary, further analyses shall be required at two-year intervals until such apportionment is made. (Capehart-Florida)
W77-00988

OBSTRUCTING BRIDGES OR STREAMS.
Wyo Stat Ann sec 35-479 (Supp 1971).

Descriptors: *Wyoming, *Obstruction to flow, *Bridges, *Streams, *Legislation, Legal aspects, State governments, Highways, Roads, Running waters, Lakes, Ponds, Bodies of water, Marshes, Sewers, Water quality control, Water pollution, Water pollution control, Water law, Reasonable use, Barriers.

In the state of Wyoming, any person, company or corporation violating the prohibition against obstructing or injuring highways, streets, bridges or streams shall, upon conviction, be fined up to one hundred dollars. Fines will also be levied for erecting or establishing any trade or business which obstructs or pollutes any water course, lake, pond, marsh or common sewer. (Cowart-Florida)
W77-00989

GARBAGE POLLUTION, DISPOSAL INTO STREAMS.
Wyo Stat Ann secs 35-462 thru 35-464 (Supp 1971).

Descriptors: *Organic wastes, *Wyoming, *Waste disposal, *Domestic wastes, *Water quality control, Legislation, Legal aspects, Streams, Rivers, Disposal, Irrigation ditches, Lakes, Surface waters, Subsurface waters, Water pollution sources, Solid wastes, Wastes, Public health, Pollutants, Water policy, Water law.

The state of Wyoming prohibits the pollution or impairment of the purity and usefulness of the waters of any spring, reservoir, stream, irrigation ditch, lake or other water supply (surface or subterrarean) if those waters are used wholly or partly as a source of public or domestic water supply. The following causes of water impairment are specifically prohibited: depositing or placing the carcass of any dead animal, or the offal or refuse matter from any slaughter house, meat market or the like; depositing any spoiled meats or fish, or any animal or vegetable matter in a putrid or decayed condition; and depositing any refuse or garbage or offensive matter. An exception to this latter prohibition is made for municipal sewage and garbage disposal systems. The throwing or placing of sawdust from a sawmill into any river, stream, creek, bay, pond, lake, canal, ditch or other water course is specifically proscribed. (Cowart-Florida)
W77-00990

PROTECTION OF PUBLIC WATER SUPPLY.
Wyo Stat Ann secs 35-184 thru 35-200 (Supp 1971).

Descriptors: *Wyoming, *Water pollution contr
*Public health, *Water policy, *Legislation, Leg
aspects, State governments, Water purificatio
Potable water, Quality control, Water qualit
Water pollution treatment, Water resource
Streams, Lakes, Ponds, Bodies of water, Aquat
life, Crops, Fish, Livestock, Wildlife.

The Wyoming state department of public hea
shall have general supervisory powers over all
land waters and over all streams, lakes, and pon
used by any city, town or public institution. T
department shall also supervise the waters used
any water or ice company as sources of wa
supply for domestic use with respect to their co
dition as it affects the public health. Any polluti
which adversely affects livestock, agricultu
crops, wildlife, fish or aquatic life is also deem
to affect public health. The board of health sh
examine waters to determine their purity and
ness for domestic use, and shall make rules
prevent pollution and secure protection for wate
Sewage is to be purified before it is discharged.
dustrial plants shall protect the water supply
taking such sanitary precautions as shall be
proved by the state board of health. Administ
tive procedures for filing complaints and condu
ing investigations as to pollution are set for
(Cowart-Florida)
W77-00991

PROTECTION OF AQUATIC WILDLIFE.
Utah Code Ann secs 23-15-3 thru -6 (Supp 1975).

Descriptors: *Utah, *Fish, *Fish conservati
*Wildlife conservation, *Regulation, Legislati
Screens, Administrative agencies, State gove
ments, Rivers, Water pollution, Aquatic envir
ment, Aquatic insects, Wildlife manageme
Diversion, Water works, Powerplants, Habitat
provement.
Identifiers: Wildlife resources, Water draining.

Utah has enacted legislation making it unlawful
any person to divert water which will endan
protected aquatic wildlife in the state. Furth
more those who take any water from s
streams, lakes or reservoirs for power purpo
must furnish screens to prevent fish from ente
powerplants or water works systems. Also,
person controlling a waterway leading to a s
waterway containing protected aquatic wild
who desires to drain or divert such waterw
thereby endangering wildlife shall give writ
notice to the Division of Wildlife Resources.
luting any waters deemed necessary for wild
purposes by the wildlife board, or any waters c
taining protected wildlife is also unlawful. Fina
unless authorized, no person may take any p
tected aquatic wildlife or wildlife eggs in any s
waters. (Lauer-Florida)
W77-00992

**STATE V ASHMORE (FIXING BOUNDAR
ADJACENT TO TIDEWATERS).**
224 SE2d 334-47 (Ga 1976). 14 p.

Descriptors: *Georgia, *Boundaries(Proper
*Intertidal areas, *Accretion(Legal aspects), L
tenure, Low water mark, Oysters, Clams, Rip
an rights, Tidal waters, Adjacent land own
Ownership of beds, Navigable waters, L
aspects, Aquiculture, Shellfish farming, Beach
Shores, Public rights, State governments, Legi
tion, Constitutional law, Judicial decisions, E
water mark.
Identifiers: Public trust doctrine.

Plaintiff state of Georgia brought suit against
fendant landowners to determine the ownershi
the foreshore and of the land accreted above
high water mark. In 1902 the high water mark
judicially determined to be the boundary for oc
front property. The legislature then enacte
statute to extend the boundary to the low w
mark, reserving certain rights of navigation to

blic. The statute was ratified by the 1945 con-
tution. The state contended that such ratifica-
n was ineffective and the original statute uncon-
tutional. The Supreme Court of Georgia held
t the 1902 act was constitutional; however, the
fect of the act was to vest fee simple title to the
reshore in the state with the exclusive right to
nt, cultivate, and harvest oysters and clams
thin the foreshore area reserved to the adjacent
downers. Addressing the issue of ownership of
d accreted from navigable tidewaters, the court
ld that such lands accrue to the adjacent lan-
wner. Two dissenting justices felt that the 1902
t set the seaward boundary at the low water
rk. (Capehart-Florida)
77-00993

**ZE AWNING AND TENT CO V WINSTON-
LEM (RIGHT TO INCREASE RATE OF
OW FROM CREEK WATERSHED UNDER
SEMENT OF SERVITUDE).**
4 SE2d 257-60 (NC Ct App 1976).

scriptors: *North Carolina, *Drainage systems,
torm runoff, *Negligence, *Natural flow, Cul-
rts, Pipes, Drains, Streams, Cities, Watersheds,
rface waters, Land tenure, Structures, Surface
inage, Roads, Conveyance structures, Floods,
noff, Storm drains, Obstruction to flow, Altera-
n of flow, Judicial decisions.

intiff landowner sought to recover compensa-
n from defendant city for flood damage. The
intiff owned property through which a small
ek flowed and which was downstream from the
y's drain culverts. The plaintiff installed 24 in.
d 36 in. drainage pipes to contain the creek
ters and permit construction of buildings on the
perty. In 1960, the city replaced its original 30
pipes with 42 in. pipes. After this, the plaintiff
perienced flooding problems caused by
ckage of his pipes with large debris. The plain-
f contended that the city had a duty to install
otective devices to prevent debris from blocking
pipes. The trial court directed a verdict for the
fendant. The Court of Appeals of North
rolina affirmed, holding that the defendant had
ed properly in that it had only accelerated the
lume and flow of water in the stream and had
t diverted the course of the creek. The court
ted that liability would not be imposed on the
fendant simply because the plaintiff's drainage
stem was inadequate to handle the increased
w caused by the defendant's larger drain pipes.
apehart-Florida)
77-00994

**ORMAN AND SCHAEN, INC V DALLAS
ITHOUT CAUSING INCREASE IN WATER
OW ACROSS PROPERTY, CITY NOT
SPONSIBLE FOR FAULTY DRAINAGE
STEM).**
5 SW2d 428-31 (Tex Ct Civ App 1976). 4 p.

scriptors: *Texas, *Storm drains, *Storm ru-
ff, *Negligence, *Floods, Natural flow, Drains,
eams, Cities, Watersheds, Surface waters,
uctures, Surface drainage, Runoff, Drainage
stems, Obstruction to flow, Alteration of flow,
gal aspects, Judicial decisions, Flood damage,
mpensation.

intiff occupants of a building that was flooded
ght compensation from defendant city for
ter damage to the contents of the building.
thin a one-month period plaintiffs' warehouse
a was flooded twice; first to a height of 19
hes, then to 28 inches. The building was located
ectly over a storm sewer which had been con-
ucted by the city along the course of a creek.
intiffs contended that the defendant was
ligent in failing to provide a storm sewer of suf-
ent size to handle the storm waters. The Court
Civil Appeals of Texas, affirming the verdict
the defendant, held that the city had no legal
ponsibility to maintain adequate drains. Stating that partial protection is better than none, the court said that the magnitude of flood protection provided is within the discretion of the city. Although a city may not increase the flow of surface waters across land, it has no duty to prevent all flooding caused by the natural drainage patterns of the watershed. (Capehart-Florida)
W77-00995

GARDNER V HAMILTON (RIGHT TO EXERCISE EMINENT DOMAIN FOR FLOOD CONTROL).
536 SW2d 422-25 (Tex Ct Civ App 1976). 4 p.

Descriptors: *Texas, *Eminent domain, *Easements, *Flood control, *Condemnation, Legislation, Legal aspects, Flood protection, Land tenure, Strucutes, Control, Water control, Cities, Water conservation, Judicial decisions.
Identifiers: Injunctive relief.

Plaintiff landowners sought to vacate an easement on 5.9 acres of their 7.77 acre tract granted by them to defendant city for flood control purposes. The plaintiffs further sought to enjoin construction of a water conservation structure on their property. The city filed a cross action to declare the easement valid or alternatively to condemn the property. The trial court set aside the easement and gave title to 5.68 acres to the city under eminent domain, requiring payment of $9806. The plaintiffs appealed, contending that the city did not have the power of eminent domain for the purpose of flood control and further contending that the proper procedures for condemnation had not been followed. The Court of Civil Appeals of Texas affirmed the trial court decision. The court held that flood control and water retention are proper purposes for the exercise of eminent domain. Furthermore, when the title to land is in dispute, the condemnor is not required to follow the same procedure as in an initial condemnation proceeding. (Capehart-Florida)
W77-00996

MC CLELLAN V JANTZEN (STOCKING OF FISH NOT AN ACT OF APPROPRIATION GIVING VESTED RIGHT IN WATER STOCKED).
547 P2d 494-97 (Ariz Ct App 1976). 4 p.

Descriptors: *Lakes, *Arizona, *Judicial decisions, *Prior appropriation, *Fish, *Stocking, Water users, Water rights, Dams, Reservoirs, Water resources, State governments, Drainage effects, Drainage.

Plaintiff was a prior appropriator of water from an aritificial lake who sought an injunction to stop the stocking of fish therein by defendant State Game and Fish Department. The legal issue was whether the act of stocking the reservoir with fish would constitute an act of appropriation requiring a permit from the State Land Department. While the appropriation of water for fish was added to the Arizona statutory body in 1962, the act of stocking fish was never intended to constitute an appropriation of that water. Rather, the statute gives the Department the authority to stock fish without appropriating of any water. Furthermore, the State Game and Fish Department contended that unappropriated waters existed in the lake. The court refused to rule on this question, however, saying instead that it was a matter for the State Land Department. It was conceivable, should no unappropriated water be found, that the lake owner could drain the lake and thus kill all the stocked fish. In that event, said the court, there would be no cause of action against him. In short, given an adverse ruling by the State Land Department, the Game and Fish Department was taking its chances by stocking the lake. (Frank-Florida)
W77-00997

SALT RIVER VALLEY WATER USERS' ASSOCIATION V GIGLIO (DUTY OF REASONABLE CARE IN DISPOSING OF FLOODWATERS ENTERING CANAL SYSTEM).
549 P2d 162-76 (Ariz 1976). 15 p.

Descriptors: *Flood routing, *Floodways, *Judicial decisions, *Canals, *Bridge design, Flood protection, Flood damage, Flood control, Flood discharge, Legal aspects, Negligence, Drainage, Drainage area, Drainage systems, Damages, Bridges, *Arizona, *Water users.
Identifiers: Salt River Valley Water Users' Assoc.

Plaintiff homeowners brought an action against the Salt River Valley Water Users' Association to recover compensatory and punitive damages for flooding of their property due to breaches in an irrigation canal operated by the association. After a 1.1 million dollar jury verdict, the defendant Association appealed to the Arizona Supreme Court, claiming that the evidence was insufficient to support a jury finding of negligence and that punitive damages were unwarranted. After reviewing the trial transcript, the Supreme Court ruled that the evidence was sufficient. The court found that several available waterways were not opened in time to relieve pressure caused by the increased water flow, and that a bridge was constructed so low so as to force the water into increased velocity to pass under it. Although not absolutely liable, the Association did owe a reasonable duty of care to those under its protection; further, a jury could have found that this care was not exercised. The fact that plaintiffs constructed their homes on a noted drainage tract was held insufficient to bar an action for recovery. Punitive damages, however, were denied because of a lack of wanton, malicious or oppressive conduct. (Frank-Florida)
W77-00998

GOWING V MC CANDLESS (CROP DAMAGE RESULTING FROM FLOODING OF OBSTRUCTED WATERCOURSE).
547 P2d 338-44 (Kan 1976). 7 p.

Descriptors: *Kansas, *Legal review, *Flood damage, *Ditches, *Timber piles, Damages, Judicial decisions, Crops, Overflow, Flood flow, Floods, Banks, Water levels, Water control.
Identifiers: Statute of Limitations.

Plaintiff landowners brought an action to recover for crop damage caused by water overflow stemming from an alleged obstruction of a watercourse by defendant lower landowners. During timber-clearing operations, the defendants obstructed a natural ditch with trees and dirt which prevented the drainage of land, thus damaging plaintiffs' crops. After the trial court found for the plaintiffs, the defendants appealed, contending that the action had not been brought within the applicable two year statute of limitations. The Kansas Supreme Court held that where an injury or wrong is classified as not original or permanent, but as temporary, transient or recurring, each injury causes a new cause of action to accrue, at least until the injury becomes permanent. Since the crop damage occurred every year for a period of years, and evidence had been introduced showing that the obstructions could have been removed at any time, the court ruled that the injury was temporary and recurring. Therefore, in the absence of permanent damages, the action claiming crop damages did not have to be brought within the two year statute of limitations, and was timely filed. The original verdict for damages was upheld. (Frank-Florida)
W77-00999

WATERSHED IMPROVEMENT DISTRICTS.
Wyo Stat Ann secs 41-354.1 thru 41-354.26 (Supp 1971).

Descriptors: *Wyoming, *Water districts, *Watershed management, *Local governments, *Watersheds(Basins), Erosion, Flood protection, Sedimentation, Water storage, Water conserva-

tion, Water utilization, Water resources, State governments, Legislation, Real property, Eminent domain, Structures, Bond issues, Appraisals, Water resources development.
Identifiers: Public hearings.

Watershed improvement districts may be formed in Wyoming to prevent and control erosion, floodwater, and sedimentation damages and to store, conserve, develop, utilize and dispose of water so as to protect land and water resources. Watershed improvement districts may be formed as sub-districts of a soil and water conservation district. They may also be located in more than one soil and water conservation district. Public hearings on the feasibility of establishing a proposed watershed improvement district are required, followed by a referendum within the proposed district. Additional territory may be added to an existing district without a referendum if there are less than ten landowners involved. The board of directors of a district shall have the power to: levy and collect assessments for special benefits; acquire and sell real or personal property; condemn private property through eminent domain; and, construct and operate any necessary structures. (Capehart-Florida)
W77-01000

LAKE WASHINGTON SHIP CANAL,
Wash Rev Code Ann sec 37.08.240 (1964).

Descriptors: *Washington, *Legal aspects, *Federal government, *Canal construction, *Canals, Canal design, Construction, Transportation, Ships, Damages, Channels, Channeling, Conduits, Excavation, United States, Spillways.
Identifiers: *Puget Sound(Wash), *Lake Washington Ship Canal(Wash).

The Federal government was planning to construct a connecting canal between Lake Union, Lake Washington and Puget Sound in the state of Washington. This Washington legislation granted the United States the right to build and operate the Lake Washington ship canal along with the necessary spillways, buildings, power plants and landways. It also granted the right to lower the waters of Lake Washington and raise the level of Salmon Bay. The United States was released from all liability to damages to this state that could arise from the lowering or raising of the waters. (Frank-Florida)
W77-01001

1971 WATER RESOURCES ACT.
Wash Rev Code Ann secs 90.54.010 thru 90.54.070 (1975).

Descriptors: *Water resources, *Legislation, Data collections, Beneficial use, Water allocation(Policy), Water utilization, Waste water disposal, Data storage and retrieval, Ecology, *State governments, Base flow, Rivers, Streams, Fish, Wildlife conservation, Impoundments, *Washington.

The Washington legislature adopted the following broad guidelines as part of its 1971 Water Resources Act: (1) uses of water for statutorily specified purposes are considered beneficial; (2) allocation of water among potential users shall be based on the securing of maximum net benefits for the people of the state; (3) all rivers and streams shall retain base flows necessary to provide for fish and wildlife preservation; (4) all reasonable and presently available methods of treatment shall be used prior to waste water entry; (5) multiple-purpose impoundment structures are to be preferred over single purpose structures; and (6) water management programs are deemed to be in the public interest. Furthermore, a water resources archive shall be established and maintained by the department of ecology to organize, collect and develop data and studies pertaining to water and related resources. (Frank-Florida)
W77-01002

HARBORS, TIDE WATERS AND WATER RIGHTS.
Wash Const art 15 secs 1 thru 2, art 17 secs 1 thru 2, art 21 sec 1.

Descriptors: *Washington, *Constitutional law, *Water rights, *Public rights, *Navigable waters, Water users, Docks, Water law, Tidal waters, Swamps, High water mark, Irrigation, Mining, State governments, Legal aspects, Harbors.

Article XV of the Washington constitution makes the following references to water law and water rights: (1) the legislature shall provide for the appointment of a commission which shall establish harbor lines in all state navigable waters, beyond which no rights shall be granted whatsoever; (2) no contract for the leasing of wharves or docks shall be made for any term longer than 30 years; (3) the state owns all beds and shores of navigable waters up to and including the ordinary high tide line; (4) the state disclaims all rights to tide, swamp and overflowed lands patented by the United States; and (5) the constitution defines the use of water for irrigation, mining and manufacturing as public uses. (Frank-Florida)
W77-01003

SHORELAND BOUNDARIES.
Wash Rev Code Ann secs 79.16.380, .419 thru .430, and .510 (1962).

Descriptors: *Legislation, *Washington, *Navigable waters, *Boundaries(Property), *Beds under water, Excavation, Locks, Gates, Shores, Construction, Canal construction, Dredging, Water utilization, Beds, Legal aspects, State governments.
Identifiers: *Fill permits.

The state of Washington has enacted legislation providing that when land is sold by the state that is adjacent to navigable waters, and the boundary is not defined, the water boundary shall be the line of ordinary navigation in such water. Where the water level is lowered either by state or federal action, the new water boundary shall be the line of ordinary navigation found in such waters after the lowering. This statute also reserves for public use all shorelands and the bed of Lake Washington, and it states specific boundaries. Where excavation of waterways is concerned, the commissioner of public lands may enter into contract with any person or company for the filling in and raising of shore lands. The governor must approve any such contract, and the restrictions on what lands shall be affected by this statute are listed. All waterways so excavated shall be public waterways, free to all citizens, with the exception of necessary tide gates or lock, the operation of which may be paid for by toll. (Frank-Florida)
W77-01004

TIDELANDS ACT; POWERS AND REGULATIONS.
Wash Rev Code Ann secs 76.16.140 thru .190 (1962).

Descriptors: *Legislation, *Washington, *Tidal waters, *Public access, *Public rights, Shellfish, Shellfish farming, Mining, Mineral industry, Oil, Oil wells, Oil industry, Access routes, Harbors, Rent, Leases, State governments, Federal government, Boundaries(Surfaces), Beds under water, Banks.
Identifiers: Water rights(Non-riparians).

The state of Washington has enacted legislation providing that certain offshore areas shall never be sold or leased for any purpose other than the extraction of petroleum, gas, or minerals. Any present leases existing for other purposes shall not be extended upon their expiration. The protected areas are listed. Certain tidelands are protected from sale or lease and reserved as public areas for recreational use and for the taking of fish and shellfish for personal use. These areas are liste
and described. Where there is no access to thes
tidelands, the director of fisheries may take actio
to provide public and private access, including t
building of roads and docks to and from the tid
lands so described. Where harbor areas and tid
lands are being rented in any manner, this statu
is applicable for the determination of rental shar
between the county and state governments. Ar
where the federal government has establishe
pierhead lines in any state waterway at a
distance from the boundaries established by t
state, no structure shall be allowed in the strip
waterway between the boundary and the neare
pierhead line except by the consent of the sta
Technical waterway boundaries are presente
(Frank-Florida)
W77-01005

DRAINAGE DISTRICTS; POWERS.
Wash Rev Code Ann secs 85.06.010 and .0
(1962).

Descriptors: *Washington, *Legal aspect
*Legislation, *Drainage districts, *Emine
domain, Drainage programs, Drainage syste
State governments, Levee districts, Draina
area, Ditches, Drains, Condemnation, Constru
tion, Dams, Outlets, Outlet works, Drainage.

The state of Washington has enacted legislati
providing that drainage districts in the state sh
have the power to sue and be sued and to conde
and appropriate private property for the constru
tion and maintenance of systems of drainage. T
power to condemn by eminent domain may be e
ercised within or without the drainage distr
boundaries. Such power must be exercised as
the property of both private corporations a
private individuals. (Frank-Florida)
W77-01006

**FLOOD CONTROL BY STATE IN COOPER
TION WITH FEDERAL AGENCIES.**
Wash Rev Code Ann secs 86.24.010 thru .0
(1962).

Descriptors: *Washington, *Legal aspects, *Flo
control, *Administration, *Governmental in
relations, Short-term planning, Water contr
Flow control, State governments, Long-te
planning, Planning, Federal government, Cons
vation, Control, Water management(Applie
Water policy, Projects, Project planning, Legis
tion.

The State of Washington has authorized the st
director of conservation to act for the state in
formulation of plans for flood control in
several flood-prone areas of the state. He sh
also consider the extent to which the state sho
participate with the federal government or a
other flood control district in the survey, planni
or construction of flood control projects. St
participation in flood control projects is limited
applicable funding provisions. This legislation e
bles the director to move outside his immedi
agency to provide flood control measures a
facilities in conjunction with other governmen
units. (Frank-Florida)
W77-01007

DIKING DISTRICTS; POWERS.
Wash Rev Code Ann secs 85.05.010 and .
(1962).

Descriptors: *Washington, *Legal aspec
*Dikes, *Construction, *Eminent domain, Cana
Ditches, Flumes, State governments, Loc
Beds, Rivers, Streams, Watercourses(Le
aspects), Planning, Compensation, State gove
ments.
Identifiers: *Diking districts.

e Washington legislature has passed enabling islation for the formation of diking districts. ch district shall have the following powers: (1) condemn and appropriate private property by inent domain for the construction and main- ance of a system of dikes; (2) to straighten, den, deepen and improve any rivers or streams wing through or located within the boundaries such diking district, or where such bodies shall er overflow and damage the land within such ing district; (3) to construct all needed dikes, ins, ditches, canals, flumes, and locks; (4) to nge the bed or course of any river; and (5) to ntract with any other diking districts for the con- uction or planning of all works or improve- nts. (Frank-Florida)
77-01008

VIGABLE WATERS PROTECTION LAW.
s Stat Ann sec 144.26 (1974).

scriptors: *Wisconsin, *State governments, egislation, *Shore protection, *Water resources velopment, Planning, Short-term planning, ng-term planning, Public rights, Public benefits, ta collections, Data storage and retrieval, Data nsmission, Coordination, Local governments.

sconsin has enacted legislation declaring that it n the public interest to make studies, establish icies, and authorize municipal shoreland regu- ons for the use, conservation, development and tection of the state's water resources. There- e, the Department of Water Resources is ected to exercise the following powers: to make ommendations to existing state agencies con- ning water resource activities; to locate and intain all pertinent information; to serve as a aringhouse for the guidance of the public in the ution of their problems; to prepare a com- hensive plan for the application of municipal linances regulating navigable waters and their relands; to prepare criteria for water protection dies and planning; and to coordinate all possible verning bodies to the benefit of the state water ources program. (Frank-Florida)
77-01009

AH LAKE DIKING PROJECT.
ah Code Ann secs 73-12-1 thru -4 (1958).

scriptors: *Water resources development, tah, *Irrigation, *Dikes, *Reservoir construc- n, Construction, Irrigation systems, Water ources, Water storage, Preservation, *Water rs, Projects, Benefits, Beneficial use, Project efits, Project purposes, Water utilization, ited States.
ntifiers: *Utah Lake(Utah), Water users as- iations.

h has enacted legislation authorizing the state's ernor to convey lands in the bed of or on the rgin of Utah Lake to the United States of erica for the purpose of assisting the federal ernment in developing water resources in the e. However, the governor shall not make any h conveyance until an agreement has been de between the United States and a water rs' association for the construction of any rage reservoir, dike, or other works necessary irrigation. Other provisions concern the nner of executing and attesting various deeds an exact description of the lands subject to act. (Lauer-Florida)
7-01010

TER CONSERVANCY ACT.
h Code Ann secs 73-9-1 thru 73-9-4, 73-9-12 n 73-9-14 (1958), as amended, (Supp 1975).

scriptors: *Utah, *Resources development, ater conservation, *Land conservation, dministrative agencies, Environmental control, eficial use, Water allocation(Policy), Regulation, Legislation, Water resources development, Public health, Local governments, Water management(Applied).
Identifiers: *Water Conservancy Act(Utah).

The Utah legislation has created Water Conservancy Districts to provide for conservation and development of state water and land resources, and to benefit the public, industries, municipalities, and lands under irrigation. Specific provisions concern: (1) requirements for establishing a district; (2) the courts which have jurisdiction to establish a district; (3) powers of the board and duties of the secretary of each district; and (4) the requirements for establishing sub-districts and their powers. Also set forth are the powers and duties of district boards in promoting water development within their respective districts. (Lauer-Florida)
W77-01011

APPROPRIATION.
Utah Code Ann secs 73-3-1, 73-3-19 thru -23 (1968).

Descriptors: *Utah, *Appropriation, *Water allocation(Policy), *Beneficial use, *Priorities, Legal aspects, Water utilization, Water rights, Water quality, Regulation, Water quality control, Jurisdiction, Damages, Distribution, Diversion, Diversion losses, Impounded waters, Prior appropriation.
Identifiers: Public waters, Right of entry.

Rights to the use of unappropriated public waters in Utah may be acquired by applying to the state engineer. The appropriation must be for some useful and beneficial purpose. Furthermore, whenever an applicant must enter private property to survey or secure information for making a water filing and is refused right of entry, he may petition the district court for an order granting such right. An applicant may also divert appropriated waters into natural streams and impound them after acquiring the approval of the state engineer. Specific regulations concern the quantity, quality and expenses involved in such appropriation. Appropriators shall have priority among themselves according to the dates of their respective appropriations. Other provisions govern the replacement of underground water by any junior appropriator whose appropriation may diminish the quantity or injuriously affect the quality of appropriated underground water in which the right to the use thereof has been established by law. (Lauer-Florida)
W77-01012

NAVIGATION LAW, SECTION 89-B.
1973 Op Att'y Gen New York 18-22. 5 p.

Descriptors: *New York, *Navigable waters, *State jurisdiction, *Judicial decisions, Ships, Political aspects, Regulation, Legal aspects, Riparian rights, Navigation, Bodies of water, Law of the sea, Water policy, Water rights, Federal jurisdiction, Reservation doctrine, Control, Legislation, Operations, Permits, Coasts.
Identifiers: *Licenses, Administrative regulations, Coastal waters, Coastal zone management.

The New York Navigation Law provides that foreign flag vessels and American vessels under registry, that is, engaged in foreign trade, which transit state territorial waters are subject to state pilotage laws. Such laws are not applicable to American vessels engaged in the domestic coasting trade. Decisions of the U.S. Supreme Court are discussed which hold that one having a federal pilot's license is not thereby qualified to navigate a foreign flag vessel or an American vessel under registry in state waters regulated by state pilotage laws. (Reinders-Florida)
W77-01013

UNAPPROPRIATED WATER IN UNDERGROUND WATER BASIN.
1973 Rep of New Mex Att'y Gen 38-9. 2 p.

Descriptors: *New Mexico, *Water conservation, *Water management(Applied), *Water allocation(Policy), Water distribution(Policy), Competing uses, Equitable apportionment, Water demand, Water utilization, Control, Regulation, Water rights, Reservoir operation, Water resources, Well permits, Water policy, Permits, Subsurface waters, Groundwater availability, Groundwater basins.
Identifiers: Water rights(Non-riparians), Administrative regulations, Licenses.

In an underground basin or reservoir with reasonably ascertainable boundaries, the State Engineer may not authorize a new water use appropriation unless unappropriated water exists or the proposed appropriation involves a non-consumptive use which will not impair existing rights. Under present law the State Engineer must determine whether unappropriated water exists on a case by case basis. The burden is upon the applicant to demonstrate that unappropriated water exists or that no impairment of existing rights will be caused. Even though no unappropriated water exists, an application for a new appropriation must nevertheless be approved provided it involves a non-consumptive use of water; that is, one that causes no net depletion of water in a reservoir and therefore does not impair existing rights. (Reinders-Florida)
W77-01014

MARINE RESOURCES COMMISSION--OYSTER GROUNDS--USE OF SUBAQUEOUS LANDS FOR CONSTRUCTION AND MAINTENANCE OF SEWAGE DISPOSAL FACILITIES.
1973-1974 Op Att'y Gen Va 236-37. 2 p.

Descriptors: *Virginia, *Sewage systems, *Oysters, *Shellfish farming, *Public lands, Public rights, Constitutional law, Sewage districts, Governments, Legal aspects, Sanitary engineering, Sewage disposal, Water law, Public utilities, Public works, Construction, Shallow water, Water types, Beds under water.
Identifiers: Water rights(Non-riparians), Public trust doctrine, Subaqueous lands, Oyster beds.

The Virginia Constitution provides that natural oyster beds in commonwealth waters are to be held in trust for the people of the state. This section does not prohibit the legislature from authorizing the use of tidal waters for any public purpose. Subaqueous lands may be used for the construction and maintenance of sewage disposal facilities. Broad authorization was given to the Hampton Roads Sanitation District Commission for the use of any state subaqueous lands. This authorization is construed to encompass lands held under private leases from the state, subject to the compensation requirement of the Fifth Amendment. (Reinders-Florida)
W77-01015

O'BRIEN V BARNES BUILDING COMPANY (DEFINITION OF TIDAL WETLANDS).
380 NYS2d 405-29 (Sup Ct 1974). 25 p.

Descriptors: *New York, *Wetlands, *Tidal waters, *Jurisdiction, *Judicial decisions, State governments, Delaware, Rhode Island, Maryland, Construction, Tides, Salinity, Administrative decisions, Storm surge, Legal aspects, Coasts.
Identifiers: *Coastal zone management, *Coastal waters, *Coastal Zone Management Act.

Plaintiff individuals and conservation group brought an action seeking an injunction to prevent defendant developers from constructing a housing development since an adjacent pond and the land surrounding it were protected tidal wetlands under

the Tidal Wetlands Act. At the heart of the suit was the interpretation of the New York statutory phrase 'areas now or formerly connected to tidal waters'. Although the phrase had not received judicial interpretation by New York courts, the plaintiffs maintained that there was no implied time limitation on the word 'formerly'. In support of their contention, the plaintiffs cited Delaware statute that defined wetlands as including areas which now or in this century have been connected to tidal waters. The court noted that the Delaware definition was in the minority, and looked to other criteria to determine the status of the water body. Under the Rhode Island and Maine statutes, which were found to represent the majority view, wetland use and susceptibility to storm flowage respectively are determinative of wetlands status. Under these statutes, the pond and the adjacent land did not qualify as wetlands. The court also noted that the pond would not be granted wetland status under the federal Coastal Zone Management Act, which uses salinity as the sole criterion in determining areas within its jurisdiction. Thus, the court found for the defendants and removed the restraining order although it did not bar a later action for an injunction on the grounds of possible environmental damage. (Frank-Florida)
W77-01016

IDAHO WATER RESOURCE BOARD V KRAMER (STATUTORY INTERPRETATION OF WATER RESOURCES BOARD COMPREHENSIVE STATE WATER PLANNING).
548 P2d 35-72 (Idaho 1976). 38 p.

Descriptors: *Idaho, *State governments, *Judicial decisions, *Water resources development, Permits, Constitutional law, Water use, Dams, Dam construction, Water supply, Water supply development, Construction, Legal aspects.

Appellant Secretary of the Idaho Water Resource Board sought dismissal of a writ of mandamus forcing him to approve an application made by respondent Board to the Federal Power Commission for a power licence. In upholding the issuance of the writ, the Idaho Supreme Court made the following findings of fact: (1) where hearings were required by the Water Resources Board in 'affected areas', that meant only those areas subject to the most immediate and direct impact of any project proposal; (2) an overall water resource plan need not be adopted in one complete act, but rather may be done in stages; (3) development and conversation of water resources is a public purpose within the meaning of the state's due process clause; and (4) this proposed joint undertaking between the Board and a private power company involved dam construction, and was not arbitrary or unreasonable. The court further ruled that the very essence of the project was to maximize the use of water, and thus, upheld the mandate over the numerous substantive and procedural objections made by the Secretary. (Frank-Florida)
W77-01017

WATERS--FISH AND GAME--DEPOSIT OF PESTICIDES IN PUBLIC WATERS.
1973 Op Att'y Gen Wisconsin 130-32. 3 p.

Descriptors: *Wisconsin, *Pesticides, *Fishkill, *Water law, *Penalties(Legal), Water pollution effects, Legislation, Pollutants, Toxins, Water pollution, Control, Constitutional law, State jurisdiction, Negligence, Legal aspects, Water pollution sources, Pesticide toxicity, Hazards, Water quality control, Chemical wastes.
Identifiers: Administrative regulations.

Wisconsin state law authorizes the Department of Agriculture to adopt rules governing the use and formulation of pesticides, and to determine the time and means of their application. The Attorney General of Wisconsin has determined that prosecution for violation of such rules is not barred by a civil action brought to recover statutory damages for the killing of fish allowed under a separate statute. Prosecution under both sections is permissible since different elements must be proven in each case. Prosecution for violation of more than one statute, arising from a single occurrance or chain of events, is not unusual and enjoys statutory sanction in Wisconsin. (Reinders-Florida)
W77-01042

RESERVE MINING CO V CITY OF DULUTH (FILTRATION OF LAKE SUPERIOR BY CORPS OF ENGINEERS).
529 F2d 181-89 (8th Cir 1976). 9 p.

Descriptors: *Potable water, *Filtration, *Domestic water, *Industrial wastes, *Lake Superior, Jurisdiction, Federal government, Mining, Legal review, Judicial decisions, Administrative agencies, Public health, costs, Water pollution, Mineral industry, Cities, Municipal water, Water purification, Mine wastes, Water quality, Treatment, Great Lakes, Lakes, *Minnesota.
Identifiers: Carcinogens, Taconite.

Appellant mining company sought relief from a district court order requiring the appellant to pay $100,000 to appellee city to provide for filtration of the city's water supply. The Eight Circuit Court of Appeals dissolved the order because of a lack of procedural due process and remanded the case to the district court for a proper determination of the costs of filtration to be charged to the appellant. The Corps of Engineers, under a district court order to provide filtered drinking water to the communities on Lake Superior because of the imminent health hazard caused by appellant's discharge of taconite tailings, sought to shift this responsibility to local officials. The Court of Appeals recognized a responsibility for local governmental cooperation but said continued federal supervision was required because of the following factors: (1) federal jurisdiction over Lake Superior; (2) pollution affecting several states; (3) legal action initiated by the federal government; (4) technical knowledge possessed by federal agencies; and (5) lack of expertise by local governments. (Capehart-Florida)
W77-01043

CIRCLE INVESTMENT CO V CITY OF TOLEDO (EFFECT OF CHANGING CANAL TO LIMITED ACCESS HIGHWAY ON ABUTTING LANDOWNERS--NO ACCESS REQUIRED).
345 NE2d 442-48 (Ohio Ct App 1975). 7 p.

Descriptors: *Ohio, *Highways, *Canals, *Public access, *Access routes, Boundaries(Property), Land tenure, Real property, State governments, Cities, Right-of-way, Judicial decisions, Canal embankments, Banks, Beds, Legal aspects, Roads, Transportation, Inland waterways, Lake Erie.

Plaintiff investment company brought suit against defendant city for a declaratory judgment proclaiming the existance of a right of way from a limited access highway to a tract of land owned by the plaintiff. The plaintiff's property was bounded on three sides by a turnpike and two railroad lines. The only physical access available was from the limited access highway on the fourth side. The limited access highway was located on land formerly occupied by the bed, banks, and towpath of a canal. The city had acquired fee simple title to the canal property by purchase from the state. The plaintiff contended that he had a right of access to the highway by virtue of a right of access to the canal. The trial court found for the defendant city and the Court of Appeals of Ohio affirmed, holding that the right of access of ownership of land abutting the canal was no greater than the public right of access; furthermore, that the change of use from a canal to a highway did not create new rights in abutting owners. The court also held that abandonment of the canal by the state did not cause the title to revert to the grantor since the interest was in fee simple. (Capehart-Florida)
W77-01044

LOUISIANA ENVIRONMENTAL SOCIETY V BRINEGAR (ENVIRONMENTAL IMPACT STATEMENT AS TO ARTIFICIAL LAKE TO BE BRIDGED BY HIGHWAY CONSTRUCTION).
407 F Supp 1309-26 (WD La 1976). 18 p.

Descriptors: *Artificial lakes, *Louisiana, *Highway relocation, *Public rights, *Bridges, Engineering structures, Water policy, Water law, Bridge construction, Judicial decisions, Legal aspects, State governments, Construction, Planning, Road construction, Economics, Environmental effects, Civil engineering, Highways, Highway effects.
Identifiers: Injunctive relief, Environmental impact statements.

Plaintiff environmental society requested an injunction to halt bridging of an artificial lake for construction of an interstate highway bypass. The U.S. District Court held that the Secretary of Transportation acted within his authority in determining that, although alternate routes were feasible, only the adopted route was prudent. The Secretary could reasonably have believed that unusual factors were present or that alternatives involved problems of extraordinary magnitude. A subsequent amendment requiring public hearings on social and environmental effects would not be required since environmental aspects had been considered in depth. Furthermore, a new drainage system incorporated into the bridge did not require a new hearing. (Reinders-Florida)
W77-01045

IT'S TIME TO STOP KILLING THE OCEAN,
National Wildlife Federation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-01046

IRRIGATION WITHOUT WASTES,
For primary bibliographic entry see Field 3F.
W77-01047

MID-SHIAWASSEE COUNTY CONCERNED CITIZENS V TRAIN (ENVIRONMENTAL IMPACT AS TO A PHYSICAL-CHEMICAL MODE OF TREATMENT FOR A WASTE-WATER TREATMENT PLANT).
408 F Supp 650-60 (ED Mich, SD 1976). 11 p.

Descriptors: *Michigan, *Judicial decision, *Decision making, *Waste water treatment, *Administrative decisions, Water policy, Grants, Projects, Water rights, Adjudication procedure, Sanitary engineering, Legislation, Intergovernmental relations, Administration, Sewage treatment, Waste water disposal, Water law, Planning, Permits, Control, Legal aspects.
Identifiers: *Environmental Impact Statement, *National Environmental Policy Act, Administrative regulations, Comparative law.

A citizen's group brought suit to compel state officials to comply with the National Environment Policy Act. The officials had approved federal and state grant assistance for construction of a physical-chemical wastewater treatment facility within the city of Owosso, Michigan. The court granted the defendants' motion to dismiss the complaint holding that where a federal agency concludes an environmental impact statement is not necessary that agency must issue a negative declaration supported by a 'mini' EIS or an environmental impact appraisal. The determination that an EIS is not necessary is subject only to an arbitrary or capricious standard of review. Thus a court will not rule on the relative merits of competing scientific opinion where the sufficiency of an EIS statement is an issue. (Reinders-Florida)
W77-01048

-MO FARMS, INC. V. UNITED STATES
)BLEM OF PROOF IN RECOVERING FOR
OD DAMAGE TO CROPS).
rimary bibliographic entry see Field 3F.
01050

Nonstructural Alternatives

ER ZONING - TOOL FOR GROUND-
ER BASIN MANAGERS,
gical Survey, Denver, Colo.
Dutcher, and L. R. Peterson.
nd Water, Vol. 13, No. 5, p 395-399, Sep-
er-October 1975. 5 ref.

riptors: *Groundwater, *Groundwater availa-
, *Groundwater basins, *Groundwater
rces, *Water zoning, Water conservation.

r zoning is not new in arid areas. Many States
laws limiting pumping. However, most of the
ng ordinances do not achieve their stated
se. Many enforce conservation of scarce
rces for benefit of future users. Some pur-
o ensure a continuous water supply to the
holders. Existing ordinances that limit
ing to the so-called safe yield do not take
or recoverable benefits into consideration,
ne period of use is not stipulated. Therefore,
pumping is regulated under such or-
ces, the basins cannot be managed to obtain
num benefits to present users of the available
y. Two types of ordinances are discussed:
al-purpose and management-plan or-
ces, which are designed to make possible the
vement of specific objectives. Examples are
of how the latter can be designed to: limit
n depletion and protect existing rights;
se pumping to increase economic return;
conjunctive use of all land, mineral, and
resources; and establish production quotas
ure optimum economic return to all users
a predetermined period. (Skogerboe-Colo

0552

N FLOOD WARNING AND WATERSHED
AGEMENT ADVANCES IN
ROPOLITAN MELBOURNE,
urne and Metropolitan Board of Works.
alia).
Earl, D. C. Thompson, J. W. Porter, J. A.
vay, and A. S. Alexander.
able from the National Technical Informa-
ervice, Springfield, VA 22161 as PB-259 549,
codes: A05 in paper copy, A01 in microfiche.
can Society of Civil Engineers, New York,
Urban Water Resources Research Program,
ical Memorandum No. 30, June, 1976. 72 p.,
3 fig., 15 ref. OWRT C-5045(No. 4224)(6).

iptors: *Urbanization, *Administrative
es, *Warning systems, *Flood protection,
l plains, *Comprehensive planning, Local
nments, Detention reservoirs, Forecasting,
quality control, Flood plain zoning, Moni-
Telemetry, Sediment control, Computer
s, Cost analysis, *Australia, *Urban
ge, Combined sewers.
iers: *Melbourne(Australia), *Dandenong
(Asustralia), Integrated management, Storm
discharges, Combined sewer overflows.

ces made in institutional arrangements and
warning systems are reported. Outlned in
are functions of the Melbourne and
politan Board of Works, flood problems it
nters, and its mitigative procedures, includ-
n-structural measures. Part II describes a
ter-operated and telemetered rainfall and
age-network for flood forecasting and pre-
recently installed in metropolitan Mel-
. Part III describes the Dandenong Valley
rity, a unique organization having responsi-
for planning, flood protection, drainage, pollution abatement and aesthetic/recreational aspects in its 286-sq. mi. jurisdiction. A number of ideas utilized and lessons learned are relevant in the U.S.(Mc Pherson-ASCE)
W77-00670

THE PARTICIPATION OF NEW YORK COMMUNITIES IN THE FEDERAL FLOOD INSURANCE PROGRAM,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Rural Sociology.
D. E. Moore, and R. L. Cantrell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 550, Price codes: A02 in paper copy, A01 in microfiche. Cornell Community and Resource Development Series, Bulletin 11, March 1976. 25 p., 1 fig., 7 tab., 20 ref. OWRT A-057-NY(1), 14-31-0001-5032.

Descriptors: *Flood insurance, *Land use, *Community development, Zoning, Building codes, *National Flood Insurance Act, Decision making, *New York, *Social participation.
Identifiers: Flood hazards, Community structure, *Community participation.

The Federal Flood Insurance Program requires that individual communities pass a land use law aimed at reducing flood losses before individuals in their respective communities can purchase flood insurance. Some communities with flood hazard areas have responded with varying rates of speed, while others have not responded at all. By July 1, 1975, more than one-third of the 745 New York communities threatened with federal sanctions had failed to act. This research develops a model to predict whether or not communities will adopt the program and their speed of adoption. The theoretical concepts employed are community differentiation, community centrality, and program need. These variables are operationalized using the presence or absence of a zoning ordinance, whether or not the community subscribes to the New York State Building Code, recent experience with flooding, and regional location in New York State. Each of these variables is positively and independently related to program adoption, speed of adoption, and whether the community initiates the action to participate or acts in response to federal notification. The findings are consistent with other studies of community innovation and change. Policy implications of the findings are discussed.
W77-00671

A REGIONAL PLANNING APPROACH TO THE FLOODPLAIN MANAGEMENT PROBLEM,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
R. N. Weisz, and J. C. Day.
Annals of Regional Science, Vol. IX, No. 3, p. 80-92, 1975.

Descriptors: *Flood protection, *Watershed management, *Integrated control measures, *Comprehensive planning, *Mathematical models, *Economic efficiency, Land use, Engineering structures, Optimization, Flood plain zoning, Building codes, Flood control, Economic rent, Arizona, Linear programming.
Identifiers: *Floodplain Management System, Pima County(Ariz).

The Floodplain Management System model (FMS) establishes a framework whereby land use and engineering methods can be combined and evaluated on a common basis to arrive at the most economically efficient flood protection solution. The model also permits identification of desirable combinations of land use and engineering works. It was tested in application to Pima County, Arizona, by considering the following alternatives: (1) Land use regulations (spatial and temporal distribution of urban land uses, site elevation through dirt fill, and floodproofing); (2) development policies (public acquisition of undeveloped land for open space, and public acquisition and removal of existing improvements from the floodplain); (3) engineering measures (dams, channel improvements). The plan formulation method is simple and straight-forward. For each possible development policy-engineering measure(s), the influence of public investment on the object row coefficients of all linear programmed land use activities is determined; the potential land use activities are screened so that only those containing economically efficient combinations of fill and floodproofing enter the LP model; the amount of land resource that is available in each location for LP land use assignments is computed; other appropriate constraints are determined, and the LP model is run. Economic rent is used to quantify the impact of each FMS mixture of means for attaining management objectives. (Auen-Wisconsin)
W77-00704

A TALE OF TWO CITIES: FLOOD HISTORY AND THE PROPHETIC PAST OF RAPID CITY,
Waikato Univ., Hamilton (New Zealand).
N. J. Ericksen.
Economic Geography, Vol. 51, No. 4, p. 305-320, 1975. 3 fig., 1 tab., 42 ref. NSF GI-32942.

Descriptors: *Flood protection, *Flood control, *Integrated control measures, *Decision making, Flood pin zoning, Future planning(Projected), Flood damage, Attitudes, *South Dakota.
Identifiers: *Rapid City(SD), Scenario analysis.

To demonstrate how new flood policies may ameliorate damage, the history of flood plain management in Rapid City is given starting from the response to its flood problem and ending with the disastrous flood of June 9, 1972. A scenario then posits what could have happened had various methods for reducing flood losses been adopted. Although the focus is on the impediments to the development of a sound flood plain management for that city it is applicable to the problems that face flood-prone communities in the over-reliance upon single engineering solutions; the lack of an integrated, multi-adjustment approach; the unawareness of constraints on the adoption of various adjustments; the inadequacy of traditional methods for evaluating adjustments; and the relevance of scenario analysis for the community decision-maker. The schism between what happened and what could have happened and what could have happened underscores the necessity for an approach that incorporates a broad range of adjustments into an integrated whole. The project evaluations conducted by federal agencies in Rapid City are at such variance with the actual outcome that the assumptions used in the various benefit-cost analyses, if not the mode of analysis itself, are questionable. A series of post-audit evaluations should be considered in selected flood-prone cities to thoroughly review the methodological procedures which denied Rapid City an adequate flood plain management program. (Auen-Wisconsin)
W77-00706

PLANNING FOR STORM WATER MANAGEMENT,
Watkins (G. Reynolds) Consulting Engineers, Inc., Lexington, Ky.
W. H. Qualls.
Public Works, Vol. 10, No. 1, p 43-47, January 1976. 2 fig, 1 tab.

Descriptors: *Kentucky, *Storm runoff, *Nonstructural alternatives, *Storm water, *Drainage basins, *Flood plain insurance, *Flood plains, *Flood plain zoning, *Detention reservoirs, *Flood control, Flood discharge, Flood protection, Floods, Flooding, Storms.
Identifiers: *Storm Water Management Plan, Wilmore(KY).

The Storm Water Management Plan is a 3 part program addressing the multiple needs of storm water

protection within a short and long-range context in the town of Wilmore, KY. The old solution was to build more storm sewers which would only push the problem downstream. It did not provide financial relief for those whose property was damaged nor maximum protection with the least expenditure. The first program of the management plan is a storm water facilities plan to propose physical improvements minimizing flood damage to existing areas and to insure that future development does not create similar flood problems. Drainage detention basins ranging from 116 to 216 acres were suggested. Land use, population projections and storm water runoff were studied to provide for future needs. Alternative plan 'A' was selected which would clean existing drainage channels; install 4 detention basins; improve certain headwells and culvert entrances, install inlet bar grates and replace drop inlets with standard inlets; construct curbs, gutters and underground sewers where detention basins are not feasible. The second part of the plan is a flood plain zoning ordinance to prevent new or reconstructed buildings from improperly encroaching on flood plains where the building might be damaged or might contribute to the intensity of downstream flooding. The third element of the management plan is federally subsidized flood plain insurance to insure existing buildings and property. (Gentry-North Carolina)
W77-00770

FLOOD PLAIN MANAGEMENT ALTERNATIVES IN THE MAITLAND AREA (AUSTRALIA),
New South Wales Univ., Kensington (Australia).
For primary bibliographic entry see Field 4A.
W77-00932

DEVELOPMENT OF FLOOD PLAIN MANAGEMENT FOR FORT COLLINS, COLORADO - A CASE STUDY OF U.S. PRACTICE,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-00933

FLOOD MITIGATION STRATEGIES: THE ROLE OF INSURANCE AND STRUCTURAL MEASURES,
New South Wales Dept. of Agriculture, Sydney (Australia).
G. A. Forsythe.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 10 - 14, June 1976. 3 ref.

Descriptors: *Flood mitigation, *Flood plain insurance, *Cost-benefit analysis, *Flood control, Non-structural alternatives, Flood protection, *Australia.

Recent occurrences of flooding in Australia have highlighted the inadequacy of existing flood mitigation policy, which relies heavily on structural measures. These measures, and insurance as a non-structural alternative, are analysed in terms of a multidimensional social welfare function. A third alternative strategy, with insurance as a base, and utilizing structural measures where feasible, is shown to effectively maximize the beneficial features of both measures. Problems relating to the workability of such a scheme are outlined. (CSIRO)
W77-00934

FLOOD STANDARDS - THE ROLE OF ENGINEERING INSTITUTIONS,
Binnie and Partners, Melbourne (Australia).
F. M. Law.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers, Australia, Preprints of Papers, p. 15 - 19, June 1976. 2 tab, 26 ref.

Descriptors: *Design standards, *Institutions, *Dam design, *Flood protection, Design criteria, Design flood, Dam failure, Project planning, Safety factors, *Australia, United States.

Subjective factors influencing the setting of flood standards are examined, with particular reference to dam safety. Recent work in Britain and Australia is compared with that in America. Standards for protecting agricultural land which may be desired by a financing authority are discussed in relation to a British example. It is concluded that professional engineering institutions offer the best means of reconciling conflicts of safety and economy in so far as these are governed by arbitrary standards. (CSIRO)
W77-00935

OPTIMIZING BENEFITS TO URBAN RESIDENTS OF A TOTAL FLOOD WARNING SYSTEM FOR THE BRISBANE VALLEY (AUSTRALIA),
Bureau of Meteorology, Brisbane (Australia). Hydrometeorology Section.
For primary bibliographic entry see Field 4A.
W77-00944

HYDROLOGY OF FLOOD MITIGATION MEASURES IN THE PAHANG RIVER BASIN, MALAYSIA - A CASE STUDY,
For primary bibliographic entry see Field 4A.
W77-00946

THE NATION'S INCREASING VULNERABILITY TO FLOOD CATASTROPHE,
J. E. Goddard.
Journal of Soil and Water Conservation, Vol 31, No 2, p 48-52, March-April 1976. 5 p 1 photo, 3 tab, 3 chart.

Descriptors: *Flood damage, *Flood plains, *Flood plain insurance, *Flood plain zoning, *Floods, Flood discharge, Flood protection, Flood recurrence interval, Floodgates, Warning systems, Diversion structures, Diversion dams, Civil engineering, Dams, Dikes, Drainage systems, State governments.

Since 1936 the federal government's response to floodplain management has generally been limited to the construction of flood control structures such as levees, walls, and detention reservoirs. These structures are designed to safeguard only against moderate floods, and thus have been ineffective against major floods. A more widespread solution should be implemented. Flood insurance, which is now almost mandatory for floodplain structures, should have universal application in flood prone areas. A major improvement should come with the advent of floodplain planning and floodplain regulations. These involve application of the police power by a locality to guide and control land use and development in flood-hazard areas. Zoning, subdivision regulations, building codes and health regulations will be the specific tools used. Furthermore, open areas are needed to provide for the passage of floodwaters. This, when combined with floodproofing, will assure minimal damage from floodwaters. (Frank-Florida)
W77-00961

FLOODPLAIN MANAGEMENT: THE IOWA EXPERIENCE,
Iowa State Water Resources Research Inst., Ames.
M. D. Dougal.
Journal of Soil and Water Conservation, Vol 31, No 2, p 60-2, March-April 1976. 3 p, 1 photo, 5 ref.

Descriptors: *Iowa, *Legislation, *Flood protection, *Flood plain insurance, *Flood plain zoning, Civil engineering, Dikes, Drainage systems, Diversion dams, Floodgates, Warning systems, Federal government, State governments, Floods, Flood discharge, Zoning.

Iowa has been among the nation's leaders in tak floodplain management steps. Urged on devastating floods in 1944 and 1947, the legislat created the Iowa Natural Resources Counci 1949. The Council had the following goals: pro tion of life and property from floods; preven of damage to lands; implementation of an ord and systematic land use plan. In connection v the development, Iowa City enacted the first cessful floodplain zoning ordinance in 1962 obtaining the support of the legal profession, l realtors, and land developers. Iowa's experie was watched closely by other cities; now, o such ordinances are being developed throug the state. The enrollment rate in federal floo surance plans has also increased greatly. Probl still to be overcome include increasing urba tion, and the need for a statewide study of st straightening problems, and for greater cons tion of flood control engineering works. (Fr Florida)
W77-00962

6G. Ecologic Impact Of Water Development

TECHNOLOGY ASSESSMENT FOR WATER DEVELOPMENT PROJE (VOLUME I),
Virodyne Corp., Littleton, Colo.
For primary bibliographic entry see Field 6B.
W77-00527

AGRICULTURAL AND ENVIRONMENTAL PACTS AS A RESULT OF INCREASED MANDS FOR ENERGY DEVELOPMENT,
For primary bibliographic entry see Field 6D.
W77-00545

POLLUTION ECOLOGY OF FRESHWATE VERTEBRATES,
For primary bibliographic entry see Field 2L.
W77-00557

SPORT FISHERIES AND OFFSHORE OIL,
New York State Dept. of Environmental C vation, Delmar. Div. of Marine and C Resources.
A. C. Jensen.
N Y Fish Game J. 21(2), p 105-116, 1974.

Descriptors: Oil pollution, Sport fishing, tinental Shelf, Northeast US, New York, En mental effects.

The possibility of exploratory and prod drilling for petroleum on the Continental Sh the Northeast Coast of the USA has arous concern of sportfishermen from New Yor neighboring states. The marine sportf resources in the area are discussed in relat the suspected petroleum reserves.—Cop 1975, Biological Abstracts, Inc.
W77-00680

HOUSING DEVELOPMENT CANALS IN COASTAL ZONE OF THE GULF OF ME ECOLOGICAL CONSEQUENCES, REC TIONS, AND RECOMMENDATIONS,
National Marine Fisheries Service, St. Peter Fla. Environmental Assessment Div.
W. N. Lindall, and L. Trent.
Marine Fisheries Review, Vol. 37, No. 10, 24, 1975. 3 fig, 18 ref.

Descriptors: *Canal construction, *We *Tidal marshes, *Estuaries, *Real pr Legislation, Intertidal areas, High water Building codes, *Environmental effects, G Mexico, Fisheries, Coastal plains.
Identifiers: Housing developments, Wat real estate, Bayfills.

ıe environmental effects of estuarine canal con-
ruction to provide waterfront housing and the
gulatory requirements to avoid ecological harm
e discussed. Real estate development canals in
yfills, inland, and intertidal developments
reaten wetland vegetation, water quality, bottom
bitats, and faunal changes with deleterious ef-
cts on fisheries. Because federal legislation
onfirmed by court decisions) regulates dredging
d filling below the high tide water mark
velopers have turned to excavating wetland
eas above the mean high tide, with Corps of En-
ieers permits only required for construction of
cess canals to navigable waters. The reluctance
the Corps to regulate dredging and filling in wet-
ıds was overcome by the court decision of
arch 27, 1975. Preliminary guidelines for the lo-
tion and design of inland canals are proposed,
cluding residential lot restrictions to high
ound; access canals to follow the shortest route
d avoid damage to intertidal marshes, sub-
erged grass beds, and oyster reefs; turbidity and
diment dispersion controls; canals to be en-
ieered as flow-through systems, supplemented
pumps; canal depth should be uniform and
thin the euphotic zone, or shallowing away from
parent body; and septic tanks and sewage ef-
ents to be disallowed in the development.
uen-Wisconsin)
7-00701

**ANNING LEVEL AND PROGRAM IMPACT
ATEMENTS UNDER THE NATIONAL EN-
RONMENTAL POLICY ACT: A DEFINI-
ONAL APPROACH,**
lifornia Univ., Los Angeles. School of Law.
W. Wegner.
CLA Law Review, Vol. 23, No. 124, p. 124-163,
75.

scriptors: *Project planning, *Federal project
licy, *Environmental effects, *Judicial deci-
ns, Multi-purpose projects, Comprehensive
nning.
ntifiers: *Environmental Impact Statements,
tional Environmental Policy Act.

e requirements of the National Environmental
licy Act for preparation of Environmental Im-
t Statements appear to be circumvented by the
rts in overlooking the critical provisions of the
t, i.e., to institutionalize an environmentally
are approach to decision-making and to provide
ecord of such decision-making susceptible to
llenge and review by the courts and the public.
e EIS preparation mechanisms are now being
bed through growing litigation bearing on time
l scope of statements: at what state in the
nning of a project must an agency declare itself
preparing an EIS, and if other projects are as-
iated with the one at issue, must a comprehen-
e, multiple-project statement be prepared.
other problem to be adjudicated is whether an
S must be prepared at that point in continuing
rse of pre-implementation planning when it has
ome apparent that a 'major federal action' ex-
. A satisfactory resolution of the definition of
ing and scope can be achieved in case law to
et the statutory EIS requirement formula is the
cept of 'a major federal action.' It can include
ttern or series of acts that seem to be part of a
gle under-taking and which need not be
npleted before an 'action' is recognized; or
ion' can be said to exist when a series of activi-
reaches a stage of coherence and maturity
ch suggests that a decision to go forward is
ng made and has a reasonable possibility of
ng implemented. (Auen-Wisconsin)
7-00705

**E ENVIRONMENTAL IMPACT OF A
RGE TROPICAL RESERVOIR: GUIDELINES
R POLICY AND PLANNING. BASED UPON
ASE STUDY OF LAKE VOLTA, GHANA, IN
3 AND 1974,**
thsonian Institution, Washington, D. C.
I. Freeman.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 430, Price codes: A05 in paper copy, A01 in microfiche. Prepared for the Agency for International Development, 1974. 97 p, 6 fig, 7 plates, 6 tab, 51 ref, append. AID/csd-2608.

Descriptors: *Planning, Social aspects, Economics, *Environmental effects, *Reservoirs, *Dams, *Planning, *Water resources development, Alternative planning, Lakes, Data, Social impact, Fish, Nutrients, Erosion, Irrigation, Africa.
Identifiers: *Lake Volta(Ghana), *Schistosomiasis *Volta River Authority, Malaria, *Ecological impacts.

By the year 2000, the portion of the world's streamflow regulated by reservoirs will increase from one-tenth to two-thirds. Many new reservoirs will be located in the tropics where reservoirs have been shown to create problems: ecological - water weeds, evaporation and/or sedimentation, obstruction of fish migration and perturbation of downstream hydrology and aquatic systems; health - impounded water as a growth medium for malaria and schistosmiasis; social and economic - resettling people from rich alluvial and flood plain farmlands. Using the Volta Lake case study and other published experience, a brief narrative of like ly impacts is given, followed by questions that should be asked to determine impacts. Guidelines are given for (1) environmental assessment of alternative impoundment sites - seismic and hydrological impacts, effect on natural rivers and forests, effects on archaelogical remains, effects on human settlements and farmland, impacts below damsite; (2) assessment of hydrological and biological impacts following dam closure; (3) assessment of environmental and ecological impacts of a tropical reservoir, including lake geology, groundwater geology, lake topography, mineral cycling, plankton, aquatic plants, fish nutrition and production, water supply and sewage, control of disease. Researchers found it was not possible to assess lake effects on groundwater movement. The main variable for the lake appears to be runoff. Problems of exposure to schistosmiasis and bacterial contamination complicate use of the lake as a water supply. Lake assimilative capacity for wastewaters is great and agricultural and industrial wastewaters are not current problems. (Gentry-North Carolina)
W77-00767

ALTERNATIVE FUTURES FOR ENVIRONMENTAL POLICY PLANNING: 1975 - 2000,
Stanford Research Inst., Menlo Park, Calif. Center for the Study of Social Policy.
For primary bibliographic entry see Field 5G.
W77-00768

ENVIRONMENTAL MANAGEMENT IN THE MALIBU WATERSHED: INSTITUTIONAL FRAMEWORK,
California Univ., Los Angeles. School of Architecture and Urban Planning.
W. D. Conn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 645, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency. Report EPA-600/5-75-018. June 1975. 99 p, 8 fig, 63 ref, 3 append. R 802836-01-0.

Descriptors: *Environment, *Institutions, *Decision-making, *Management, *Comprehensive planning, *Land use, *Water quality, Coastal areas, Air quality, Flooding, Soils, Seismic studies, Wildlife, Recreation, Transportation, Zoning, *California.
Identifiers: *Malibu(CA), Santa Monica Mountains, Special purpose agencies, Socioeconomic environment, South Coast Regional Commission(CA), General Plan for Los Angeles County(CA), Pepperdine University(CA).

An attempt is made to identify and assess the role of government agencies in the planning and decision-making processes affecting land use, coastal resources, air quality, water quality, flooding, soils, seismic safety, wildlife, recreation and transportation in the Malibu watershed area. Regulatory controls on development include building permits, Coastal Commission permits, air quality controls, water quality controls, and the availability of essential services such as water supply, sewage treatment and access roads. Problems with current environmental management include: planners and policy-makers at the local level are not sufficiently responsive to the public; there is poor coordination among local agencies administering regulations governing water quality control sanitation, fire protection and other essential services; no mechanism exists to coordinate regional, state or national special purpose agencies protecting a critical resource, or to resolve conflicts between special purpose agency objectives and policies; delays in preparation and implementation of plans may give time for actions to be taken which reduce the effectiveness of those plans or controls. Recommendations are: special purpose agencies should be coordinated at the state level by an umbrella agency, which would take over the role of comprehensive planning; a special agency should be established to protect the special environmental significance of the Santa Monica Mountains; reforms to provide checks and balances on the Board of Supervisors and Regional Planning Commission should be instituted. (Gentry-North Carolina)
W77-00769

CONTRACTING FOR SOCIAL IMPACT ASSESSMENT,
G. E. Willeke, and C. A. Willeke.
Prepared for the Army Corps of Engineers, Institute for Water Resources, Fort Belvoir, VA. Final Report. IWR Contract Report 76-1, June 1976. 39 p, 1 tab, 3 ref, append. DACW31-75-M-1574.

Descriptors: *Contracts, *Research and development, *Social aspects, *Economic impact, *Social impact.
Identifiers: *Social Impact Assessments(SIA), National Environmental Policy Act of 1969.

Social Impact Assessments (SIA) have become increasingly more important since the passage of the National Environmental Policy Act of 1969. The problems a contracting agency (usually an Army Engineer District) faces are locating the best qualified contractors in the new field (a market development problem), writing an adequate Statement of Work Tasks, and adequately monitoring the contract and utilization of results. At the District and Division level, recommendations are: supplement advertising in Commerce Business Daily with ads in newsletters and journals, presentations at meetings and direct solicitation; addition of social scientists to District and Division staffs; improving the Scope of Work statement; use of fuller range of contracting options, such as limited competition for contracts; consolidating related SIAs into a single contract; have more than one person monitor a contract. Recommendations for the Headquarters level are: have more planners and project coordinators attend courses on contracting; facilitate feedback of Office of the Chief of Engineers (OCE) and Board of Engineers for Rivers and Harbors (BERH) reactions to impact assessments; OCE should publish a summary of the Corps' budget each year; OCE, through the Institute for Water Resources (IWR), should accumulate files on the social impact of water resources facilities and programs; develop and refine computer and data base capability; encourage use of questionnaires and interview schedules; the Department of Commerce should consolidate SIA contract advertisements into a specified area in the Commerce Business Daily so that the periodical will be more effective in reaching SIA contractors. (Gentry-North Carolina)

W77-00771

GUIDE PLAN REPORT, ANDROSCOGGIN RIVER BASIN, MAINE AND NEW HAMPSHIRE, REGIONAL AND INTERSTATE OVERVIEW.
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-00774

MODEL ANALYSIS OF EFFECTS ON WATER LEVELS AT INDIANA DUNES NATIONAL LAKESHORE CAUSED BY CONSTRUCTION DEWATERING,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 4B.
W77-00863

MARINE AND ESTUARINE SANCTUARIES. PROCEEDINGS OF THE NATIONAL WORKSHOP ON SANCTUARIES, 28-30 NOVEMBER 1975, WASHINGTON, D. C.,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W77-00888

THE SOCIAL AND ECONOMIC IMPORTANCE OF THE CARONI SWAMP IN TRINIDAD AND TOBAGO,
Michigan Univ., Ann Arbor. Dept. of Natural Resources.
B. S. Ramdial.
Ph. D. Thesis, 1975. 269 p, 24 fig, 9 tab, 9 append.

Descriptors: Mangrove swamps, Ecosystems, Evaluation, Fishing, Shellfish, Natural resources, *Swamps, Land use, Recreation demand, Resources, Tourism, National Parks, Economics, Social values, Water resources, Lagoons, Estuaries, Wetlands.
Identifiers: Trinidad, Tobago, Fin fish, Caroni Swamp(Trinadad-Tobago).

The purpose of this study was to assess the social and economic values of the Caroni Swamp as of 1974 and to generate more attention and wider public interest in one of Trinidad and Tobago's most beautiful landscapes. The study finds various unmet need states such as temporary escape, experiencing nature, intellectual stimulation, affiliation, achievement and physical exercise are gratified by a visit to the Swamp. Over 90% of the visitors thought it worthy of preservation. The study estimates the recreational resources of the Swamp at $1,038,500 and the number of persons earning a living at 240 full-time and 105 part-time. It estimates the fin and shell fish harvest and value at 1,580,170 lbs. and $981,450 and based on a total annual return of $2,020,020, calculates the present worth of the Swamp at $4,000 per acre. The study concludes that the Swamp, though neglected, has many social and economic values beyond tourism. It is biologically productive and it is recommended that the Swamp be declared a National Park. (NOAA)
W77-00893

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 1. MARINE MAMMALS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab. NOAA, Environmental Research Laboratories Principal Investigator's Reports for the Year Ending March 1976, April 1976, 434 p.

Descriptors: *Mammals, *Resources development, *Environmental effects, *Continental shelf, Ecology, *Alaska, Remote sensing, *Marine animals, Assessments, Distribution, Ice, Sea ice, Life history studies, Marine biology, Baseline studies, *Oil pollution.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Seals, Whales, Trophic relationships, Otters.

This is the first volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: Analysis of Marine Mammal Remote Sensing Data; Baseline Characterization: Marine Mammals; Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska; Resource Assessment; Abundance and Seasonal Distribution of Bowhead and Belukha Whales - Bering Sea; Abundance and Seasonal Distribution of Bowhead and Belukha Whales - Beaufort Sea, Northeastern Chukchi Sea; Morbidity and Mortality of Marine Mammals; Biology of the Harbor Seal; The Natural History and Ecology of the Bearded Seal and the Ringed Seal; An Aerial Census of Spotted Seals; Trophic Relationships Among Ice Inhabiting Phocid Seals; Assessment of the Distribution and Abundance of Sea Otters Along Kenai Peninsula, Kamishak Bay and the Kodiak Archipelago; Distribution and Abundance of Sea Otters in Southwestern Bristol Bay; Population Assessment, Ecology, and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska; and The Relationships of Marine Mammal Distributions, Densities, and Activities of Sea Ice Conditions. (NOAA)
W77-00901

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 2, MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab. NOAA, Environmental Research Laboratories Principal Investigator's Reports for the Year Ending March 1976, April 1976, 601 p.

Descriptors: *Resources development, *Environmental effects, *Birds, *Habitats, *Migratory birds, Breeding, *Alaska, *Continental Shelf, Ecology, Baseline studies, Assessments, Distribution, Ecosystems, *Oil pollution.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, *Seabirds.

This is the second volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the Environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska; A census of Seabirds on the Pribilof Islands; Ecosystem Dynamics - Birds and Marine Mammals; The Reproductive Ecology, Foods, and Foraging Areas of Seabirds Nesting on St. Paul Island, Pribilof Islands; Breeding Ecology of the Gulf of Alaska Herring Gull Group (Larus argentatus and Larus glaucescens); Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska; Shorebird Dependence on Arctic Littoral Habitats; Avifaunal Utilization of the Offshore Island near Prudhoe Bay, Alaska; and Seabirds on the South Shore of Seward Peninsula, Alaska. (NOAA)
W77-00902

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 3. MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab. NOAA, Environmental Research Laboratories Principal Investigator's Reports for the Year Ending March 1976, April 1976, 647 p.

Descriptors: *Resources development, *Environmental effects, *Alaska, *Continental Shelf, Ecology, Baseline studies, Assessments, Distribution, Ecosystems, Birds, Breeding, Habitats, Migratory birds, *Oil pollution.
Identifiers: *Gulf of Alaska, *Outer Continental Shelf, Bering Sea, Beaufort Sea, Pack ice.

This is the third volume in a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, when over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska during the Northern Summer; The Distribution, Abundance, and Feeding Ecology of Birds Associated with the Bering Sea and Beaufort Sea Pack Ice; and Seasonal Distribution and Abundance of Marine Birds. Part I. (NOAA)
W77-00903

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 4 MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab. NOAA, Environmental Research Laboratories Principal Investigators' Reports for the Year End ing March 1976, April 1976. 362 p, numerous fig tab, ref.

Descriptors: *Resources development *Environmental effects, *Alaska, *Continental shelf, Ecology, Baseline studies, Assessments Distribution, Ecosystems, *Birds, Habitat, Migratory birds, Population, *Oil pollution.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, *Seabirds, Population dynamics, Trophic relationships.

This is the fourth volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: Seasonal Distribution and Abundance of Marine Birds: Part 2. Aerial Surveys; Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies; Review and Analysis of Literature and Unpublished Data on Marine Birds; Migration of Birds in Alaskan Coastal and Marine Habitats Subject to Influence by OCS Development; Feeding Ecology and Trophic Relationships of Alaskan Marine Birds; and Population Dynamics of Marine Birds. (NOAA)
W77-00904

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 5 FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab. NOAA, Environmental Research Laboratories Principal Investigators' Reports for the Year End ing March 1976, April 1976, 715 p.

Descriptors: *Resources development *Environmental effects, *Alaska, *Continental Shelf, Ecology, Baseline studies, Assessments Distribution, Ecosystems, *Fish, *Plankton *Benthos, *Littoral, Productivity, *Oil pollution
Identifiers: *Outer Continental Shelf, *Beaufort Sea, *Bering Sea.

This is the fifth volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in

ing Sea: The Distribution, Abundance, Diver-, and Productivity of the Western Beaufort Sea thos; and Summarization of Existing Litera- and Unpublished Data on the Distribution, ndance, and Life Histories of Benthic Organ- of the Beaufort Sea. (NOAA)
-00905

VIRONMENTAL ASSESSMENT OF THE ASKAN CONTINENTAL SHELF. VOLUME 6. H, PLANKTON, BENTHOS, LITTORAL.
ional Oceanic and Atmospheric Administra-, Boulder, Colo. Environmental Research s.
AA Environmental Research Laboratories cipal Investigators' Reports for the Year End-March 1976, April 1976, 587 p.

criptors: *Resources development, vironmental effects, *Alaska, *Continental f, Ecology, Baseline studies, Assessments, ribution, Ecosystems, *Fish, *Plankton, nthos, *Littoral, Productivity, *Oil pollution.
tifiers: *Outer Continental Shelf, *Gulf of ka, *Beaufort Sea, *Bering Sea.

is the sixth volume of a set of fourteen which ent baseline studies of the natural resources of Alaska Continental Shelf as well as studies of environmental effects of the development of resources in that area with particular emphasis il pollution. This volume contains the follow-studies: Herring Spawning Surveys - Southern ng Sea; Razer Clam Habitat Survey - Gulf of ka; Kenai Peninsula Study of Littoral Zone: A cription and Numerical Analysis of the Fac- Affecting the Processes of Production in the of Alaska; Review and Evaluation of Histori-Data Base on Non-Salmonid Pelagic Resources he Gulf of Alaska Shelf and Slope; and eline Characterization: Littoral Biota, Gulf of ka and Bering Sea. (NOAA)
-00906

VIRONMENTAL ASSESSMENT OF THE ASKAN CONTINENTAL SHELF. VOLUME 7. H, PLANKTON, BENTHOS, LITTORAL.
onal Oceanic and Atmospheric Administra-, Boulder, Colo. Environmental Research s.
AA, Environmental Research Laboratories cipal Investigators' Reports for the year End-March 1976, April 1976, 675 p.

criptors: Resources development, vironmental effects, *Alaska, *Continental f, Ecology, Baseline studies, Assessments, ribution, Ecosystems, *Fish, *Benthos, toral, *Plankton, Productivity, *Oil pollution.
tifiers: *Outer Continental Shelf, *Gulf of ka, *Bering Sea, *Beaufort Sea.

is the seventh volume of a set of fourteen h present baseline studies of the natural urces of the Alaska Continental Shelf as well tudies of the environmental effects of the lopment of the resources in that area with par-ar emphasis on oil pollution. This volume con- the following studies: Plankton of the Gulf of ka-Ichthyoplankton; Plankton of the Gulf of ka-Initial Zooplankton Investigations; oplankton of the Gulf of Alaska; Zooplankton Micronekton in the Bering-Chukchi/Beaufort ; Phytoplankton Studies-Bering Sea; Baseline ies of Demersal Resources of the Northern of Alaska Shelf; Baseline Studies of Demer-Resources of the Eastern Bering Sea Shelf; fort Sea Estuarine Fishery Study; The Dis-tion, Abundance, Diversity and Productivity enthic Organisms in the Gulf of Alaska; A marization of Existing Literature and Un-shed Data on the Distribution, Abundance, Productivity of Benthic Organisms of the Gulf laska and Bering Sea; Food and Feeding Rela-hips in the Benthic and Demersal Fishes of Gulf of Alaska and Bering Sea; Preparation of Illustrated Keys to Skeletal Remains and Otoliths of Forago Fishes/Literature Search and Data Conversion on Density Distribution of Fishes of Beaufort Sea; Alaska Marine Ichthyoplankton Key; Littoral Survey of the Beaufort Sea; and Beaufort Sea Plankton Studies. (NOAA)
W77-00907

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 8, EFFECTS OF CONTAMINANTS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
NOAA, Environmental Research Laboratories Principal Investigators' Reports for the Year Ending March 1976, April 1976. 392 p.

Descriptors: Resources development, *Environmental effects, *Toxicity, Pollutants, *Oil pollution, *Photosynthesis, *Water pollution effects, *Alaska, *Continental Shelf, Ecology, Baseline studies, Assessments, Distribution, Ecosystems, Fishes.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Bering Sea, *Hydrocarbons, *Biological effects, *Petroleum hydrocarbons, *Sea grasses, Contaminants, Petroleum, Sublethal effects, Trace metals, Arctic Oceans, Subarctic waters, Crude oil.

This is the eighth volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: The Physiological Effect of Acute and Chronic Exposure to Hydrocarbons and of Petroleum on the Near-Shore Fishes of the Bering Sea; Physiological Impact of Oil on Pinnipeds; Acute and Chronic Toxicity, Uptake, and Depuration and Sublethal Metabolic Response of Alaskan Marine Organisms to Petroleum Hydrocarbons; Sublethal Effects as Reflected by Morphological, Chemical, Physiological, and Behavioral Indices; Identification of Major Processes in Biotransformations of Petroleum Hydrocarbons and Trace Metals Assessment of Available Literature on Effects of Oil Pollution on Biota in Arctic and Subarctic Waters; Acute Effects - Pacific Herring Roe in Gulf of Alaska: Acute and Chronic Toxicity of Sea-Water Extracts of Alaskan Crude Oil to Zoese of the Dungeness Crab, Cancer magister, Dana; and Sublethal Effects - Effects on Seagrass Photosynthesis. (NOAA)
W77-00908

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 9. CHEMISTRY AND MICROBIOLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
NOAA, Environmental Research Laboratories Principal Investigators' Reports for the Year Ending March 1976, April 1976. 555 p.

Descriptors: Resources development, *Environmental effects, Pollutants, *Sea ice, *Aromatic compounds, *Trace elements, *Alaska, *Continental shelf, Ecology, Baseline studies, Assessments, Distribution, Ecosystems, *Chemistry, *Microbiology, Microorganisms.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Bering Sea, Beaufort Sea, Petroleum, Hydrocarbons.

This is the ninth volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea; Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska: Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons; Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements; and Distribution of Light Hydrocarbons, C1-C4, in the Gulf of Alaska and Southeastern Bering Shelf. (NOAA)
W77-00909

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 10. CHEMISTRY AND MICROBIOLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
NOAA, Environmental Research Laboratories Principal Investigators' Reports for the Year Ending March 1976, April 1976. 436 p.

Descriptors: Resources development, *Environmental effects, *Oil pollution, *Pathology, *Heavy metals, *Alaska, *Continental Shelf, Ecology, Baseline studies, Assessments, Distribution, Ecosystems, Bacteria.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Bering Sea, Beaufort Sea, Crude oil, Psychrophilic bacteria.

This is the tenth volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaskan Shelf Areas; Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria; Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf; Microbial Release of Soluble Trace Metals from Oil-Impacted Sediments; and Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea. (NOAA)
W77-00910

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME II. PHYSICAL OCEANOGRAPHY AND METEOROLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
NOAA, Environmental Research Laboratories Principal Investigators' Reports for the Year Ending March 1976, April 1976. 996 p.

Descriptors: Resources development, *Environmental effects, *Oceanography, *Meteorology, Pollutants, *Continental Shelf, *Alaska, Ecology, Baseline studies, Assessments, Ecosystems, Ocean currents, Ocean circulation, Climatology, *Oil pollution.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Bering Sea, Beaufort Sea, Oceanographic data, Current measurements, Water masses, Atmospheric models.

This is the eleventh volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: Development and Operation of HF Current-Mapping Radar Units-

Physical Oceanography; Beaufort Shelf Surface Currents; Current Measurements in the Beaufort Sea; Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas; Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-MOP); Numerical Studies of Alaskan Region; Bristol Bay Oceanographic Processes (B-BOP); STD Mappings of the Beaufort Sea Shelf; Outer Continental Shelf Energy Program; Preparation of Hydrodynamical-Numerical and Three-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska; Mesoscale Currents and Water Masses in the Gulf of Alaska; Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program; Transport of Pollutants in the Vicinity of Pradhoe Bay; Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas; Physical Oceanography of the Gulf of Alaska; and Near-Shore Atmospheric Modification. (NOAA)
W77-00911

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 12. GEOLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
NOAA, Environmental Research Laboratories Principal Investigators' Reports for the Year Ending March 1976, April 1976. 679 p.

Descriptors: Resources development, *Environmental effects, Hazards, *Seismic studies, *Volcanoes, *Sedimentation, *Glacial sediments, *Geomorphology, *Permafrost, *Geology, *Alaska, *Continental shelf, Ecology, Baseline studies, Assessments, Distribution, Ecosystems, Suspended solids, Ice cover, *Oil pollution.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Pribilof Islands, Aleutian Islands.

This is the twelfth volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: Seismotectonic Study of the Seismic and Volcanic Hazards in Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea; Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation); The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain; Delineation and Engineering Characteristics of Permafrost beneath the Beaufort Sea; Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf; Offshore Permafrost Studies, Beaufort Sea; and Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions. (NOAA)
W77-00912

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 13. GEOLOGY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
NOAA, Environmental Research Laboratories Principal Investigator's Reports for the Year Ending March 1976, April 1976. 430 p.

Descriptors: Resources development, *Environmental effects, *Alaska, *Continental Shelf, Ecology, Assessments, Distribution, Baseline studies, *Geology, *Permafrost, *Benthos, Seismology, *Earthquakes, *Sedimentation, Erosion, Deposition, *Oil pollution.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, St George Basin, Coastal processes.

This is the thirteenth volume of a set of fourteen which present baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: Faulting and Slope-Instability in the St. George Basin Area and Immediately Adjacent Continental Shelf and Upper Continental Slope of the Southern Bering Sea; Yukon Delta Coastal Processes Study; Fault History of Pribilof Islands and its Relevance to Bottom Stability in St. George Basin; Earthquake Activity and Ground Shaking in and along the Eastern Gulf of Alaska; Erosion and Deposition of Shelf Sediments: Eastern Gulf of Alaska; Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska; Seismic and Volcanic Risk Studies-Western Gulf of Alaska; Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes, and Models; Beaufort Seacoast Permafrost Studies; Benthos-Sedimentary Substrate Interactions; Faulting and Instability of Shelf Sediments: Western Gulf of Alaska; Seismicity of the Beaufort Sea, Bering Sea, and Gulf of Alaska; and A Study of Beaufort Sea Coastal Erosion, Northern Alaska. (NOAA)
W77-00913

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 14. ICE.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
NOAA, Environmental Research Laboratories Principal Investigators' Reports for the Year Ending March 1976, April 1976. 459 p.

Descriptors: Resources development, *Environmental effects, *Ice, *Oil pollution, *Sea ice, Remote sensing, *Alaska, *Continental Shelf, Ecology, Baseline studies, Assessments, Distribution, Ecosystems.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Near shore ice, Morphology.

This is the fourteenth volume of a set of fourteen which presents baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: The Interaction of Oil with Sea Ice in the Arctic Ocean; Dynamics of Near-Shore Ice (Near-Shore Radar Transponder and Fast Ice Studies); Dynamics of Near-Shore Sea Ice in Shear Zone (Data Buoys); Study of Climatic Effects on Fast Ice Extent and Its Seasonal Decay Along the Beaufort Sea Coast; Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice; Morphology of Bering Near-Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing; Morphology of Beaufort Near-Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing; Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures; Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study; Development of Hardware and Procedures for In-Sity Measurement of Creep in Sea Ice and Operation of an Alaskan Facility for Applications of Remote-Sensing Data to Outer Continental Shelf Studies. (NOAA)
W77-00914

WISCONSIN NATURAL RESOURCE USE CONTROLS AND ASSISTANCE.
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6E.
W77-00915

CARRYING CAPACITY PROTOTYPE INVESTIGATIONS IN THE STATE OF HAWAII, SUMMARY REPORT,
Hawaii State Office of Environmental Quality Control, Honolulu. Steering Committee on Carrying Capacity Studies.
February 1976. 48 p. 8 fig.

Descriptors: *Carrying capacity, *Growth rate, *Environment, *Natural resources, *Human population, Planning, *Hawaii, Water supply, Water quality, Model studies, Stress, Methodology, Decision Making.
Identifiers: *Overpopulation, Environment stress, Prototype studies, Maui(Hawaii), Oahu(Hawaii), Pearl Harbor(Hawaii).

The limited capacity of environmental systems to absorb growth and of resource systems to support growth, and the corresponding need to base future growth management decisions on an understanding of such limits are the underlying motives for the carrying capacity determinations of single systems while acknowledging that other interrelated systems may combine in synergistic and antagonistic effects. These studies were aimed at acquiring first-hand experience in dealing with the carrying capacity concept by addressing it for specific locations and from the perspective of representative resource and environment-related concerns. The procedures developed and used in these investigations characterize the elements of a methodology that are generalizable as a decision-making tool. The prototype studies were directed to a single system approach, i.e., on the provision of a water supply and the maintenance of water quality in specific segments of Hawaii, and to provide meaningful and practical results while stressing the need for an integrated approach to carrying capacity studies in order to address the spheres of decision-making related to growth, infrastructure and support systems, and to criteria and standards. Determination of various carrying capacities and their main implications provide a display of major tradeoffs associated with achieving selected environmental standards. (Auen-Wisconsin)
W77-00917

OPTIMAL TAXATION POLICIES FOR CONSERVATION AND RECYCLING,
Florida Univ., Gainesville. Dept. of Economics.
R. Lusky.
Journal of Economic Theory, Vol. 11, No. 3, p. 315-328, 1975. 5 fig., 5 ref.

Descriptors: *Recycling, *Administrative decisions, *Conservation, National resources, Mathematical models, Pollutants, Taxes, Government finance, Pollution charges(Taxes).

A fully integrated model of conservation, production, and recycling is presented in a framework of a natural resource cycle—beginning with extraction from a stock of the resource, moving to intermediate production, final consumption, and closing by recycling the consumption residuals. It is assumed that the natural resource stock affects both utility and the recycling activity. In a laissez-faire market equilibrium, consumers and producers fail to take into account the dynamic effect of the stock of resources due to lack of appropriability when deciding upon the optimal rate of extraction and recycling, no one takes into account his individual effect upon the stock nor the effect of the stock upon his own consumption and production. This failure results in a suboptimal rate of resource extraction. The model shows that centralized decision-making internalizes the stock externality and thereby produces the optimal allocation solution. Optimality can also be reached in a decentralized system with the use of the proper tax-cum-subsidy scheme. In the recycling model where the destruction of the recycled material is the original stock, the optimal solution involves a subsidy to firms engaging in recycling activities; this subsidy, which is separated from the necessary decentralized tax plan, was found to be equal to the value of an extra unit of the resource. (Auen-Wisconsin)
W77-00921

ENVIRONMENTAL PROTECTION AND SOCIAL ALLOCATION OF INVESTMENTS,
Erasmus Univ., Rotterdam (Netherlands).
A. P. Mastenbroek, and P. Nijkamp.

rnational Regional Science Review, Vol. 1, 1, p. 73-86, 1975. 2 fig., 1 tab., 8 ref.

criptors: *Pollution abatement, *Mathematical lels, *Investment, *Evaluation, Standards, nning, Economic efficiency, Air pollution, er pollution, Decision making.
ntifiers: *Environmental damages, vironmental standards.

near programming model is presented based on tiple sectors, multiple regions and multiple pol-nts (thus including input-output linkages and over effects) defines spatial allocation of in-ment activities both for productive and en-nmental purposes. It is designed for planning nomic activities which have environmental im-s and provides a quantitative basis for en-nmental administration, for planning of invest-t projects, for tax/subsidy regulations, etc. It rporates environmental standards which could be exceeded whatever the volume of industrial luction, or private consumption and of trans-ation may be. The implicit economic evalua- of environmental standards is reflected by low prices. The regional surplus (the sum of aggregated sectoral values minus the sum of costs of environmental deterioration in each on) is maximized subject to a set of con-nts. A comparison of the effects of an in-se in the damage costs of pollution (via ges or taxes) to the effects of a policy of cing admissible levels of pollution (by impos-quality standards) shows that the latter policy latively more effective. The shadow prices of ssion standards give indications of the societal ation of these standards. A nonlinear exten- of the environmental model focuses on the e of the cost curve of environmental deteri-ion as well as on the cost effects of environ-tal protection and pollution control. (Auen-consin)
-00922

INTERNATIONAL LAW OF THE SEA: A E FOR A CUSTOMARY APPROACH,
h Carolina Univ., Columbia. School of Marine nce.
primary bibliographic entry see Field 6E.
-00956

ANNUAL REPORT, (WASHINGTON TURAL RESOURCES AND RECREATION NCIES).
primary bibliographic entry see Field 5G.
-00957

RESOURCES DATA

Network Design

TERSHED MANAGEMENT AND DECI-N MAKING IN RELATION TO COMPUTER DWARE, COMMUNICATIONS AND SOFT-RE DESIGN),
rocomp, Inc., Palo Alto, Calif.
primary bibliographic entry see Field 7C.
-00619

LYSIS OF HISTORICAL WATER-QUALI-DATA AND DESCRIPTION OF PLAN FOR A PLING NETWORK IN CENTRAL AND THERN FLORIDA,
ogical Survey, Tallahassee, Fla.
primary bibliographic entry see Field 5A.
-00858

ROLOGY OF FLOOD MITIGATION MEA-ES IN THE PAHANG RIVER BASIN, AYSIA - A CASE STUDY,
primary bibliographic entry see Field 4A.
-00946

7B. Data Acquisition

DEVELOPMENT OF A SYSTEM TO DETECT AND MONITOR SEDIMENT POLLUTION,
Rhode Island Univ., Kingston. Dept. of Civil and Ocean Engineering.
For primary bibliographic entry see Field 5B.
W77-00539

A SIMPLE TUBE-TYPE WATER PROFILE SAMPLER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5A.
W77-00641

AN INEXPENSIVE THERMISTOR FLOWMETER FOR AQUATIC BIOLOGY,
Duke Univ., Durham, N. C. Dept. of Zoology.
M. LaBarbera, and S. Vogel.
Limnology and Oceanography, Vol. 21, No. 5, p 750-756, September 1976. 4 fig, 7 ref.

Descriptors: *Instrumentation, *Flowmeters, *Flow measurement, Flow rates, Equipment, Electronics, Electronic equipment, Measurement, Calibrations, Anemometer, Aquatic environment, Aquatic life, Biology.
Identifiers: *Thermistor flowmeters, Thermistors.

A newly developed thermistor flowmeter could measure current speeds from 0.2 to 50 cm/s with a spatial resolution of 0.1 cm and a response time of 200 ms. The output of the meter approximated a logarithmic function of the ambient water velocity. The flowmeter itself had a low power consumption, and the output could be stored on magnetic tape using a bettery-powered cassette recorder, which made possible a continuously recording portable or self-contained underwater unit. (Sims-ISWS)
W77-00645

RESEARCH FOR THE DEVELOPMENT OF GUIDELINES FOR CONDUCTING AND ANALYZING AN ENVIRONMENTAL WATER QUALITY STUDY TO DETERMINE STATISTICALLY MEANINGFUL RESULTS,
Arkansas Univ., Fayetteville. Water Resources Research Center.
M. D. Springer.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-259 496, Price codes: A08 in paper copy, A01 in microfiche. Arkansas Water Resources Research Center, Publication No. 37, Engineering Experiment Station, Research Report No. 26, March 1976. 164 p, 26 tab, 16 ref, append. OWRT A-033-ARK(1), 14-34-0001-5057.

Descriptors: *Model studies, *Methodology, *Statistical methods, *Statistical models, Data collections, Estimating, Testing procedures, Analytical techniques, Correlation analysis, Regression analysis, Sampling, Water quality.

This report presents and discusses the basic statistical models and methods which are useful to researchers in the field of water resources research, as well as in other fields. These models and methods are presented from the standpoint of type (parametric and nonparametric - or distribution free) and purpose (e.g., simulteneous comparison of several means, comparison of two or more variances, establishment of a difference between two means with a specified confidence, etc.). Emphasis is primarily upon methodology; necessary assumptions upon which each model is based are included. No derivations or proofs are given, since these are found in numerous textbooks on statistics. Emphasis is also placed upon the need for the researcher to determine before obtaining data the type of statistical model and analysis required, so that he can use that model or method which is most powerful, and so that he will have the proper data to permit the most efficient analysis. Failure to carry out such preliminary planning relevant to the selection and application of a statistical model will almost result in either a lack of sufficient relevant data or in the gathering of extraneous data, either of which is unnecessarily costly. Each method is illustrated by an example, together with an interpretation of the result.
W77-00677

A TIME RELATED AUTOMATIC TOTAL-LOAD SEDIMENT SAMPLER,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2J.
W77-00843

THE USE OF COLOR INFRARED PHOTOGRAPHY FOR THE DETERMINATION OF SUSPENDED SEDIMENT CONCENTRATIONS AND SOURCE AREAS,
Forest Service (USDA), Fort Collins, Colo. Arapaho-Roosevelt National Forest.
For primary bibliographic entry see Field 2J.
W77-00844

GAGING SEDIMENT-LADEN FLOWS WITH V-NOTCH WEIRS,
Agricultural Research Service, Columbia, Mo. North Central Watershed Research.
For primary bibliographic entry see Field 2J.
W77-00845

ACCURACY OF EVAPOTRANSPIRATION RATES DETERMINED BY THE WATER-BUDGET METHOD, GILA RIVER FLOOD PLAIN, SOUTHEASTERN ARIZONA,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 2D.
W77-00868

WATER RESOURCE EVALUATION USING PHOTOGRAMMETRIC AND REMOTE SENSING TECHNIQUES,
Laurie, Montgomerie and Pettit Ltd., Sydney (Australia).
For primary bibliographic entry see Field 4A.
W77-00937

7C. Evaluation, Processing and Publication

STATISTICAL MODELS FOR PRECIPITATION,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 2B.
W77-00537

DEVELOPMENT OF WATER QUALITY SAMPLING PROGRAMS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5A.
W77-00618

(WATERSHED MANAGEMENT AND DECISION MAKING IN RELATION TO COMPUTER HARDWARE, COMMUNICATIONS AND SOFTWARE DESIGN),
Hydrocomp, Inc., Palo Alto, Calif.
N. H. Crawford.
Simulation Network Newsletter, Vol. 8, No. 1, p 1-4, January 1976. 2 fig.

Descriptors: Technology, Hydrology, *Computers, *Communication, Water resources development, *Watershed management, *Decision making, Data collections.

Technical advances important to hydrology and water resources are taking place in computer hardware, communications, and software design. A water resource management system requires orderly organization of information, analysis of the consequences of decisions, operational criteria, and a means to implement the decisions that are taken. The most important current trend in computer hardware is toward ultra small and inexpensive logical components. A microcomputer can be built into a raingage or a streamgage, giving these devices decision making power. Transmission of field data to satellites, followed by readout into a data bank is currently being tested in the United States. Such a system is practical even if the data are not used in real-time, if the satellite can collect data at lower cost than the alternate field trip to the gage site. Software needs include data base systems that store, update, and retrieve time series; simulation software to investigate policy and development alternatives; system management software to locate optimum or near optimum control strategies; and interactive or conversational linkages between the user and the other types of software. The cost of software in water resource systems already exceeds the hardware costs and will probably increase. (Snyder-FIRL)
W77-00619

COMPUTERIZED CITY-WIDE CONTROL OF URBAN STORMWATER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-00634

EVALUATING GROUND-WATER PATHS USING HYDRAULIC CONDUCTIVITIES,
Agricultural Research Service, Chickasha, Okla. Texas-Oklahoma Area.
For primary bibliographic entry see Field 2F.
W77-00651

HYDROGEOPHYSICAL EQUIVALENCE OF WATER SALINITY, POROSITY AND MATRIX CONDUCTION IN ARENACEOUS AQUIFERS,
National Physical Research Lab., Pretoria (South Africa). Geophysics Div.
For primary bibliographic entry see Field 2F.
W77-00652

RESEARCH FOR THE DEVELOPMENT OF GUIDELINES FOR CONDUCTING AND ANALYZING AN ENVIRONMENTAL WATER QUALITY STUDY TO DETERMINE STATISTICALLY MEANINGFUL RESULTS,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 7B.
W77-00677

PROGRAM SPECIFICATION FOR THE SEWER AND WATER ACCOUNTS PROCESSING MODULE - READING USAC PROJECT.
For primary bibliographic entry see Field 5G.
W77-00773

DIGITAL SIMULATION OF AGGRADATION AND DEGRADATION IN NATURAL STREAMS,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 2J.
W77-00818

WATER RESOURCES OF THE ROCK RIVER WATERSHED, SOUTHWESTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
H. W. Anderson, Jr., W. L. Broussard, D. F. Farrell, and P. E. Felsheim.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va 22202, price $1.75. Hydrologic Investigations Atlas HA-555, 1976. 3 sheets, 14 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Minnesota, Water supply, Hydrologic data, Streamflow, Floods, Low flow, Hydrogeology, Aquifer characteristics, Groundwater movement, Dissolved solids, Duration curves, Hydrographs, Maps.
Identifiers: *Rock River(Minn), Missouri River tributary.

This Hydrologic Atlas is one of series describing the 39 watershed units in Minnesota. The 1,750 sq mi in the Rock River watershed are glaciated upland plain including all of Rock County and parts of Pipestone, Murray, Lincoln, Nobles and Jackson Counties. The average annual water budget shows 25.8 inches precipitation, 3.1 inches surface runoff and 22.7 inches evapotranspiration. Water use in million gallons for 1970 was 3,333 ground water and 274 surface water. Domestic supplies accounted for 37 percent livestock 37 percent, and industrial 26 percent of total use. All 18 municipalities use ground water, mostly from glacial drift, seven use water from Precambrian aquifers. Precipitation recharges ground water through glacial deposits. Water-table and potentiometric maps and section show ground-water movement. Highest streamflow results from snowmelt and spring rains followed by recession in flow through summer, fall, and winter. Surface water and ground water are both very hard. Surface water and water from surficial and shallow drift aquifers generally range from 450 to 1,000 mg/liter dissolved-solids concentrations. Water from deep drift and from bedrock generally exceeds 1,000 mg/liter dissolved-solids concentration except where Precambiian quartzite aquifers underlie pre-Wisconsin drift. (Woodard-USGS)
W77-00848

WATER RESOURCES OF THE ROOT RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
W. L. Broussard, D. F. Farrell, H. W. Anderson, Jr., and P. E. Felsheim.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va 22202 Price $4.25. Hydrologic Investigations Atlas HA-548, 1976. 3 sheets, 9 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Minnesota, Water supply, Hydrologic data, Streamflow, Flow rates, Hydrogeology, Aquifer characteristics, Groundwater movement, Surface-groundwater relationships, Dissolved solids, Duration curves, Hydrographs, Maps.
Identifiers: *Root River(Minn).

This Hydrologic Atlas is one of a series describing the 39 watersheds in Minnesota. The Root River watershed includes Houston, Winona, and parts of the surrounding counties. The 2,570 square miles in the watershed varies from gently rolling prairie in the west to an area of plateaus separated by valleys deeply incised into bedrock in the north and east. The average annual water budget for 30 years shows 29.5 inches of precipitation, 7.2 inches of surface runoff, and 22.3 inches of evapotranspiration. Water use in millions of gallons for 1970 was established at 7,310 of ground water and 6,700 of surface water. Domestic supplies accounted for less than one fourth and thermoelectric power for about one half of the total use. All 33 municipalities use ground water from bedrock aquifers, and 21 of those obtain at least part of their supply from the Prairie du Chien-Jordan aquifer. Many private domestic wells are completed in a shallow limestone aquifer. The ground-water system is recharged primarily by infiltrating precipitation in upland areas Ground-water movement is indicated by water-table and potentiometric maps and section diagrams. Water from bedrock and glacial aquifers generally is of acceptable quality f domestic use, dissolved solids generally less th 400 mg/liter very hard, and locally high iron co tent. The Mount Simon-Red clastics aquifer is l cally saline. Runoff is greatest during the spri when snowmelt occurs and the soils are general saturated. (Woodard-USGS)
W77-00849

GEOHYDROLOGY OF THE LOWLAND LAKE AREA, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
C. Zenone.
Water-Resources Investigations 76-22, 1976. sheets, 11 fig, 12 ref.

Descriptors: *Groundwater resources, *Lake *Hydrogeology, *Urbanization, *Alaska, Aquif characteristics, Glacial sediments, Water level Water demand, Water utilization, Maps, Surfac groundwater relationships.
Identifiers: *Anchorage(Alaska).

Unconsolidated deposits, chiefly of glacial orig make up the surficial geologic materials in t Anchorage lowland lakes area, the western part the Anchorage glacial outwash plain. Postglaci accumulation of peat, commonly 5 to 10 feet thic and the presence of ground water at or very ne the surface combine to create the swamp-musk terrane of much of the area. Deeper, confine ground water is also present beneath thick silt a clay layers that underlie the surficial deposit Domestic water supply for the lowland lakes ar is provided largely by public-supply wel completed in the deep, confined aquifers. No lar perennial streams traverse the area, thus strea flow is not a major parameter in the area's natur water balance. The major uses of surface wat are recreational, including fishing and boating several of the larger lakes, and private and co mercial aircraft operations at Hood-Spena Lakes floatplane base. The hydrology and wat balance of these lakes is complex. Water levels some lakes appear to be closely related to adjace ground-water levels. Other lakes are evident perched above the local water table. The relati of lake level to adjacent ground-water level m vary along the shoreline of a single lake. The effe of residential development practices on lake bas water balance is not completely understood. Sand Lake, the largest lake in this area of rapid u banization, the water level has declined about feet since the early 1960's. (Woodard-USGS)
W77-00850

GEOHYDROLOGY AND WATER SUPPL SHEYMA ISLAND, ALASKA,
Geological Survey, Anchorage, Alaska.
A. H. Feulner, C. Zonone, and K. M. Reed.
Open-file map report 76-82, 1976. 1 sheet, 4 fig, tab, 6 ref.

Descriptors: *Water supply developmen *Surface waters, *Groundwater, *Water qualit *Alaska, Available water, Hydrogeology, Da collections, Surface-groundwater relationship Maps.
Identifiers: *Shemya Island(Alaska).

Sheyma Island, Alaska, was occupied as a milita base in 1942. Since that time, potable water h been supplied by streams, lakes, wells, and in t late 1950's, a gallery system. The island is a lo lying, wave-cut platform composed of pyroclast and volcanic rocks with some intrusives. Bedroc is overlain by thin glacial deposits. Most of t island's present surface is relatively thick pe deposits. On the southern and western sides of t island active sand dunes are present. Groun water supplies are limited by the dense bedroc only a small amount of water penetrates into fra ture systems. Most ground-water movement is the overlying glacial and peat deposits. Groun water moves generally from north to south acro the island. Currently water supplies are draw

m the gallery system which is capable of viding about 200,000 gallons per day. An emer- cy water supply is available from two wells. ditional supplies could be developed by either ling to the existing gallery or constructing an litional gallery near the present gallery system. e chemical quality of water analyzed from the ery well generally approximates that of surface er on the island. None of the constituents in nples from streams, lakes, or ground water, ex- t the August 27, 1970, analysis for Lower ke, exceed the recommended limits for drinking er (Environmental Protection Agency, 1973). oodard-USGS)
7-00851

ULATION OF DISSOLVED OXYGEN AND OCHEMICAL OXYGEN DEMAND PLANTA- ON CANAL, BROWARD COUNTY, ORIDA, WITH AN EVALUATION OF THE AL-I MODEL FOR USE IN SOUTH ORIDA,
ological Survey, Tallahassee, Fla.
primary bibliographic entry see Field 5B.
7-00852

OUND-WATER LEVELS AND WELL CORDS FOR DISCONTINUED OBSERVA- ON WELLS IN IDAHO, 1915-72: PART A,
ological Survey, Boise, Idaho.
G. Sisco.
ho Department of Water Resources, Boise, ic-Data Release No 3, Part A, March 1976. 261 2 fig, 40 ref.

criptors: *Groundwater, *Water levels, *Well a, *Observation wells, *Idaho, Basic data col- ions.
ntifiers: *Discontinued observation wells, orthern and southwest Idaho.

data collected from observation wells in Idaho presented in 3 reports (A, B, and C). This re- (A) contains all data for discontinued obser- on wells from 1915-72 in the following coun- Ada, Adams, Boise, Boundary, Canyon, ter, Elmore, Gem, Kootenai, Latah, Owyhee, ette, Valley, and Washington. (See also W77- 55 and W77-00856) (Woodard-USGS)
7-00854

OUND-WATER LEVELS AND WELL CORDS FOR DISCONTINUED OBSERVA- N WELLS IN IDAHO, 1915-72: PART B,
ological Survey, Boise, Idaho.
G. Sisco.
ho Department of Water Resources, Boise, ic-Data Release No 3, Part B, March 1976. 389 fig, 40 ref.

criptors: *Groundwater, *Water levels, *Well , *Observation wells, *Idaho, Basic data col- ons.
ntifiers: *Discontinued observation wells, uth-central Idaho.

data collected from observation wells in Idaho presented in 3 separate reports (A, B, and C). report (B) contains all data for discontinued rvation wells from 1915-72, in the following nties: Blaine, Butte, Camas, Cassia, Gooding, me, Lincoln, Minidoka, and Twin Falls. (See W77-00854 and W77-00856)
-00855

OUND-WATER LEVELS AND WELL CORDS FOR DISCONTINUED OBSERVA- N WELLS IN IDAHO, 1915-72: PART C,
ological Survey, Boise, Idaho.
. Sisco.
o Department of Water Resources, Boise, c-Data Release No 3, Part C, March 1976. 360 fig, 40 ref.

Descriptors: *Groundwater, *Water levels, *Well data, *Observation wells, *Idaho, Basic data collections.
Identifiers: *Discontinued observation wells, *Southeast Idaho.

The data collected from observation wells in Idaho and presented in 3 reports (A, B, and C). This report (C) contains all data for discontinued observation wells from 1915-72 in the following counties: Bannock, Bear Lake, Bingham, Bonneville, Caribou, Clark, Franklin, Fremont, Jefferson, Madison, Oneida, Power, and Teton. (See also W77-00854 and W77-00855) (Woodard-USGS)
W77-00856

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA--VOLUME 2. BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Reston, Va.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $5.55. Water-Supply Paper 2129, 1976. 678 p, 1 fig.

Descriptors: *Hydrologic data, *Surface waters, *Streamflow, *Lakes, *California, Oregon, River basins, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow, Reservoir stages.
Identifiers: *Pacific Slope basins(Calif).

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Pacific slope basins in California from Arroyo Grande to Oregon State line except Central Valley. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum, discharges. (Woodard-USGS)
W77-00857

ANALYSIS OF HISTORICAL WATER-QUALITY DATA AND DESCRIPTION OF PLAN FOR A SAMPLING NETWORK IN CENTRAL AND SOUTHERN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5A.
W77-00858

WATER RESOURCES OF THE WARM SPRINGS INDIAN RESERVATION, OREGON,
Geological Survey Portland, Oreg.
For primary bibliographic entry see Field 4A.
W77-00864

AN EXPERIMENT IN THE PRODUCTION OF 'POP' FORECASTS USING A STATISTICAL MODEL,
National Weather Service, Honolulu, Hawaii. Pacific Region.
For primary bibliographic entry see Field 2B.
W77-00889

A RECORD ARKANSAS RAINFALL - THE EL DORADO DELUGE,
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W77-00897

COASTAL ENGINEERING DATA NETWORK,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 2L.
W77-00898

STATISTICAL, METEOROLOGICAL AND DEPTH-AREA ANALYSIS OF RAINFALL,
Israel Meteorological Service, Bet Dagan; and Israel Ministry of Transport and Communications, Tel-Aviv.
For primary bibliographic entry see Field 2B.
W77-00900

AN APPROACH TO A RELATIVE TROPHIC INDEX FOR CLASSIFYING LAKES AND RESERVOIRS. (A PRELIMINARY ANALYSIS OF NATIONAL EUTROPHICATION SURVEY DATA COLLECTED DURING THE 1972 SAMPLING PERIOD).
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-00930

NITROGEN AND PHOSPHORUS IN WASTEWATER EFFLUENTS. (A PRELIMINARY ANALYSIS OF NATIONAL EUTROPHICATION SURVEY DATA COLLECTED DURING 1972-73 SAMPLING PERIOD).
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-00931

FREQUENCY ANALYSIS OF FLOOD DATA IN QUEENSLAND (AUSTRALIA),
Department of Primary Industries, Brisbane (Australia).
For primary bibliographic entry see Field 4A.
W77-00936

WATER RESOURCE EVALUATION USING PHOTOGRAMMETRIC AND REMOTE SENSING TECHNIQUES,
Laurie, Montgomerie and Pettit Ltd., Sydney (Australia).
For primary bibliographic entry see Field 4A.
W77-00937

STATISTICS: WHEN WILL WE EVER LEARN,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Water Resources Branch.
N. M. Ashkanasy.
In: Hydrology Symposium, Sydney, Australia, 1976. The Institution of Engineers Australia, Preprints of Papers, p. 30 - 34, June 1976. 1 fig., 4 tab., 21 ref.

Descriptors: *Statistical methods, Risks, Forecasting, Frequency analysis, Flood mitigation, Monte Carlo method, Distribution patterns.

Statistics are playing role in engineering evaluation, but doubts exist as to whether engineers' and hydrologists' grasp of the concept of risk is much better than that of the general public. Use of such terms as 'return period' and 'recurrence interval' do nothing to dispell such doubts. A concept of risk is developed based on the product of uncertainty arising out of each step in a statistical evaluation. The basic theory behind development and utilization of frequency distributions is discussed, but it appears that there is little statistical evidence to distinguish between them, especially in the light of the doubts which exist about their underlying assumptions. Recent 'Monte Carlo' experiments indicate furthermore that knowledge of the 'right' distribution is less important than even a limited knowledge about other factors involved in the design of flood alleviation

policies and structures. It is concluded that engineers and hydrologists need to carefully review their attitudes if statistical methods are to be wisely used. (CSIRO)
W77-00938

A STAGE-DAMAGE CURVE FOR THE BRISBANE RIVER (AUSTRALIA),
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 4A.
W77-00943

BENEFIT-COST STUDIES IN THE PAHANG RIVER BASIN STUDY (MALAYSIA),
For primary bibliographic entry see Field 4A.
W77-00947

ERAMS SURFACE AND DRINKING WATER COMPONENTS, JANUARY--MARCH 1974.
Office of Radiation Programs, Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W77-00954

RADIOACTIVITY IN KANSAS SURFACE WATERS, JANUARY--DECEMBER 1972.
Kansas State Board of Health, Topeka. Radiation Control Section.
For primary bibliographic entry see Field 5A.
W77-00955

BOUNDARIES OF ARID REGIONS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
M. P. Petrov.
Problosooe-Niya Pustyn' 2, p 3-10, 1975.

Descriptors: *Arid lands, *Arid climates, *Regions, Deserts, Grasses, Soils, Dicots, Monocots.
Identifiers: *Boundaries(Arid lands).

When subdividing arid lands climatic, lithoedaphic and landscape boundaries should be distinguished. The climatic boundaries are not definite and dynamic; the boundaries of lithoedaphic types of deserts and semideserts are more definite, mostly linear (monocots, dicots and grasses mentioned). Landscape boundaries are complicated but sometimes linear.–Copyright 1976, Biological Abstracts, Inc.
W77-01032

GENERAL RECORDS AND NEW MORPHOMETRIC DATA FOR AN ENVIRONMENTAL STUDY ON LAKE ISEO, (IN ITALIAN),
Padua Univ. (Italy). Instituto di Botanica e Fisiologia Vegetale.
For primary bibliographic entry see Field 2H.
W77-01041

8. ENGINEERING WORKS

8A. Structures

INFLUENCE OF ICE UPON CONSTRUCTION, AND METHODS OF COMBATTING ICE PROBLEMS.
Army Cold Region Research and Engineering Lab., Hanover, N. H.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-012 005, Price codes: A08 in paper copy, A01 in microfiche. CREEL Draft Translation 422, October 1974. 276 p. Translated from Trudy Koordinatsionnykh Soveshchaniy po Gidroteknike (Translation of Coordinating Conference on Hydraulic Engineering), No. 17, 1965.

Descriptors: *Ice, *Ice cover, *Construction, *Arctic, Cold regions, Ice jams, Cold weather construction, Hydraulic structures, Reservoirs, Harbors, Rivers, Equations, Navigation, Bridges, Civil engineering, Structures.
Identifiers: *Ice cover effects, *Ice loads, Ice pressure, Ice cover strength.

This collection of 25 articles dealt with the variety of ice related factors which influences the specifications for building in an arctic environment. Based on the studies done concerning the effect of ice on completed structures, these articles presented logical approaches to estimating effective ice loads and how to determine the necessary ice protective measures while building reservoirs, hydraulic structures, harbor slips, etc. Several articles were concerned with how to weaken ice strength or increase the rate of thawing. (Sims-ISWS)
W77-00663

EVALUATION OF AN EXTENSIVE SEDIMENT CONTROL EFFORT IN THE LOS ANGELES RIVER BASIN,
Forest Service (USDA), Turlock, Calif. Stanislaus National Forest.
For primary bibliographic entry see Field 4D.
W77-00801

SEDIMENT CONTROL AT IMPERIAL DAM,
Bureau of Reclamation, Yuma, Ariz. Yuma Projects Office.
For primary bibliographic entry see Field 4D.
W77-00802

MODEL ANALYSIS OF EFFECTS ON WATER LEVELS AT INDIANA DUNES NATIONAL LAKESHORE CAUSED BY CONSTRUCTION DEWATERING,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 4B.
W77-00863

ARK-MO FARMS, INC. V. UNITED STATES (PROBLEM OF PROOF IN RECOVERING FOR FLOOD DAMAGE TO CROPS).
For primary bibliographic entry see Field 3F.
W77-01050

8B. Hydraulics

FREE SURFACE FLOW IN A CHANNEL OF LARGE RELATIVE ROUGHNESS,
Technical Univ. of Istanbul (Turkey), Dept. of Hydraulics and Water Power.
For primary bibliographic entry see Field 2E.
W77-00649

FORCES ON A ROUGH BED IN OSCILLATORY FLOW,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 2L.
W77-00650

INFLUENCE OF ICE UPON CONSTRUCTION, AND METHODS OF COMBATTING ICE PROBLEMS.
Army Cold Region Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 8A.
W77-00663

HEAT DISPERSION IN PHYSICAL ESTUARINE MODELS; REPORT 2, EXPERIMENTS IN THE DELAWARE RIVER MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W77-00665

INTEGRAL-EQUATION ANALYSIS OF FLOW OVER ERODING BEDS,
Mississippi Univ., University. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-00682

WAVE GENERATOR,
For primary bibliographic entry see Field 8C.
W77-00691

HYDRAULIC MODEL STUDIES OF NAVAJ DAM AUXILIARY OUTLET WORKS AND HO LOW-JET VALVE BYPASS--MODIFICATION TO REDUCE DISSOLVED GAS SUPERSATU RATION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8C.
W77-00739

MODEL STUDY OF THE DRAG COEFFICIEN OF A STREAMBED PARTICLE,
Agricultural Research Service, Oxford, Mis Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W77-00816

CHARACTERISTICS OF STABLE NATURA CHANNELS AND THEIR RELATION T CHANNEL DESIGN,
Agricultural Research Service, Oxford, Mis Sedimentation Lab.
D. G. DeCoursey, and C. G. Hunt.
In: Proceedings of the Third Federal Inter-Agen Sedimentation Conference, 1976; Denve Colorado, March 22-25 1976. Water Resourc Council, Washington, D.C., Sedimentation Co mittee, p 5-13 - 5-24, 1976. 12 tab, 13 ref.

Descriptors: *Channels, *Channel morpholog *Model studies, Mathematical models, Regim Alluvial channels, Flow, Streamflow, Bank Equations, Deposition(Sediments), Sediment tion, Tractive forces, Sediment transport, Er sion, Sedimentology.

Interest in the design of stable stream channels h been spurred by recent problems of channel s bility on artificially straightened or newly co structed channels. Solutions are not readily avai ble. This report the second of two papers deali with stream channel stability, was based on da collected at straight, stable reaches of a lar number of stream gaging stations in or ne Oklahoma. Cross sections of two differe straight, stable reaches at each station were us to calculate channel slopes, cross-sectional area and other characteristics. Samples of the bank a bed materials were analyzed for Atterberg limi pH, particle-size distribution, angle of repose, a cation exchange capacity. The first pap presented a statistical evaluation of the relati between the channel characteristics and t characteristics of the bank and bed materials. Th second paper presented the regime and tracti force theories of channel design, based on the sumption that the channels are in balance. It al related the bank and bed materials characterist to the channel characteristics through the regi and tractive force equations of stable chann design. (See also W77-00775) (Sims-ISWS)
W77-00828

OBSERVED CHANNEL CHANGES IN A MOU TAIN STREAM DUE TO INCREASED FLO FROM TRANSBASIN IMPORTS,
Bureau of Reclamation, Denver, Colo. Flo Hydrology Section.
P. O. Abbott.
In: Proceedings of the Third Federal Inter-Agen Sedimentation Conference, 1976; Denve Colorado, March 22-25, 1976. Water Resourc

uncil, Washington, D.C. Sedimentation Com-ttee, p 5-25 - 5-36, 1976. 5 fig, 1 tab, 7 ref.

scriptors: *Channel morphology, *Imported ter, *Diversion tunnels, Water importing, ountains, Streamflow, Streambeds, Flow, Chan- flow, Scour, Erosion, Sedimentation, Projects, nnels, Diversion structures, Diversion. ntifiers: Transbasin diversion.

anticipation of increased flow in the channel of ke Fork due to two recently completed trans-in diversions, data were collected on the flow, nnel geometry, and bed composition of that nnel for the pre-development period. During ly stages of the new diversions, the effect of increased flow in the channel was observed. er a period of years, during which these in-ased flows will be carried in the Lake Fork annel, data will be collected which should ow additional light on the processes involved in untain stream channel adjustment. (See also 7-00775) (Sims-ISWS)
7-00829

PLICABILITY OF THE UNIT STREAM WER EQUATION,
ny Engineer District, Chicago, Ill.
r primary bibliographic entry see Field 2J.
7-00830

ANNEL CHANGES IN THE COLORADO VER BELOW GLEN CANYON DAM,
reau of Reclamation, Denver, Colo. Engineer-and Research Center.
r primary bibliographic entry see Field 2J.
7-00832

ODEL STUDY OF RIVERBED MATERIAL IN NYON FERRY DAM SPILLWAY STILLING SIN,
reau of Reclamation, Denver, Colo. Engineer-and Research Center.
primary bibliographic entry see Field 2J.
7-00834

ANNEL IMPROVEMENTS OF THE MISSOU-RIVER,
orado State Univ., Fort Collins. Dept. of Civil gineering.
primary bibliographic entry see Field 4D.
7-00836

LD SLOPE STABLE CHANNELS. A OCHASTIC DESIGN APPROACH,
rida Univ., Gainesville. Dept. of Civil En-eering.
primary bibliographic entry see Field 2J.
7-00896

ASTAL ENGINEERING DATA NETWORK,
ifornia Univ., San Diego, La Jolla. Inst. of rine Resources.
primary bibliographic entry see Field 2L.
7-00898

DEL FOR A STUDY,
ny Engineer District, Baltimore, Md.
primary bibliographic entry see Field 2L.
7-00971

. Hydraulic Machinery

VAGE SYSTEM,
primary bibliographic entry see Field 5D.
7-00561

NK CLARIFICATION PLANT,
e (F. B.) and Co., Balmain (Australia).
For primary bibliographic entry see Field 5D.
W77-00563

SLUDGE ELEVATOR FOR FLUID CLARIFICATION SYSTEM,
Cincinnati Butchers Supply Co., Ohio. (Assignee).
For primary bibliographic entry see Field 5D.
W77-00564

AUTOMATION IN SEWAGE PROCESSING,
Siemens A.G., Karlsruhe(West Germany). Measurement and Process Engineering Div.
For primary bibliographic entry see Field 5D.
W77-00586

INSTRUMENTATION IN THE WATER INDUSTRY.
For primary bibliographic entry see Field 5A.
W77-00601

DEMONSTRATION OF WATER QUALITY ENHANCEMENT THROUGH THE USE OF THE GARTON PUMP,
Oklahoma Water Resources Research Inst. Stillwater.
For primary bibliographic entry see Field 5G.
W77-00669

WAVE GENERATOR,
M. W. Gustafson, and K. R. Loqvist.
U.S. Patent No. 3,965,364, 5 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 4, p 1821, June 22, 1976.

Descriptors: *Patents, *Waves(Water), *Ocean waves, *Energy, *Energy conversion, Energy transfer, Floats, Floating, Buoyancy, Turbines.

A device for utilizing energy stored in wave motion is described. At least one buoyant body floating on the water surface and moving vertically with the waves is connected to at least one restraining energy recipient. The buoyant body or float is anchored in a way which permits unrestricted movement in an essentially vertical direction independently of the wave height and water depth when acted upon by the heaving waves. One lower member connected to the buoyant body is comprised of at least two oppositely rotating propellers on different vertical shafts. The propellers are positioned at a distance below the buoyant body which locates them fully or partially at a depth where the surrounding water has substantially no vertical motion. The reciprocating vertical motion generated by the waves, forces the propellers to rotate as they are being moved through the tranquil water layers. The propeller drive one common or two separate pumps which pump water into a pressure vessel that is partly filled with air. This vessel is connected to a water turbine. The turbine or the propellers can be used to drive an electric generator. (Sinha-OEIS)
W77-00691

POWER GENERATING MACHINE ACTUATED BY OCEAN SWELLS,
E. L. Parr.
U.S. Patent No. 3,965,365, 9 p, 14 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 947, No 4, p 1821, June 22, 1976.

Descriptors: *Patents, *Waves(Water), *Ocean waves, *Energy, *Energy conversion, *Energy transfer, Equipment, Floating, Buoyancy, Powerplants.
Identifiers: Ocean swells.

A power generating machine is actuated by the continuous swells occurring in the ocean. The machine is supported on a pair of spaced main floats, between which is a power float connected to a linkage which allows the power float to reciprocate vertically with the passing swells. A flywheel is driven through a one way clutch connected to the float linkage to drive an electrical generator, the linkage also being coupled to an air compressor. Sensing floats privotally attached to the main float support structure detect the contour of the swells and, through associated drive means, cause the spacing of the main floats to be adjusted to the existing swells crest spacing for maximum efficiency. (Sinha-OEIS)
W77-00692

LINE STATUS TRANSDUCER,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
U. Milano.
Report REC-ERC-76-17, October 1976. 9 p, 6 fig, 1 tab.

Descriptors: Voltage regulations, Electrical insulators, Transmission lines, Electronic equipment, Instrumentation, Power system operation.
Identifiers: Photoelectricity, High voltage, Capacitive voltage dividers, Transmission line status indicators, Insulator potential detectors, High-voltage dividers, Electrical status indicators, On-off potential detectors, *Transducers.

The line status transducer was developed to provide an inexpensive and reliable means of obtaining an indication as to whether an electric power system segment is energized or deenergized. Status information is derived from the voltage sensed across a modified electrical insulator. The insulating qualities of the insulator are unaffected by the addition of the sensor. The transducer can monitor any power system segment operating at or above 13.8 kV (line to line). Included in the report are descriptions of circuit functions, installation, alinement, and evaluation tests. (Bur of Reclam)
W77-00738

HYDRAULIC MODEL STUDIES OF NAVAJO DAM AUXILIARY OUTLET WORKS AND HOLLOW-JET VALVE BYPASS--MODIFICATIONS TO REDUCE DISSOLVED GAS SUPERSATURATION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
P. L. Johnson.
Report REC-ERC-76-5, April 1976. 30 p, 19 fig, 2 tab, 2 ref.

Descriptors: *Supersaturation, *Dissolved gases, *Outlet works, Cavitation, Energy dissipation, Erosion, *Hydraulic models, Design, Model studies, Dams, *New Mexico, Jets, Valves.*
Identifiers: *Navajo Dam(N Mex).

Operation of the auxiliary outlet works and the 762-mm (30-inch) hollow-jet valve bypass at Navajo Dam results in high levels of dissolved gas supersaturation in released waters. These high dissolved gas levels, which are caused by the deep penetration of the flow into the spillway stilling basin pool, have had adverse effects on the fishery. Structural modifications were considered which included a flattening of the trajectory of the jet from the 762-mm (30-inch) bypass and the addition of a deflector or flip lip to the auxiliary outlet works. A 1:48 scale hydraulic model was used to refine and evaluate these modifications. Depth of jet penetration, degree of energy dissipation, strength of back eddies returning into the stilling basin, potential for cavitation development below the flip lip, and simplicity of design were factors considered in the evaluation. (Bur of Reclam)
W77-00739

THE ROLE OF SEDIMENT PROBLEMS IN HYDROELECTRIC DEVELOPMENT,
Federal Power Commission, Washington, D.C. Office of Energy Systems.
For primary bibliographic entry see Field 4D.
W77-00826

DESIGN LIMITS ON CRITICAL FLOAT EMERGENCE IN A TETHERED FLOAT BREAKWATER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
D. M. Hanes, and R. J. Seymour.
Sea Grant Publication No. 44, IRM Reference 76-2, January 1976. 12 p, 4 fig, 1 tab, 3 ref. NOAA-04-5-158-20.

Descriptors: *Breakwaters, *Design criteria, *Engineering structures, *Shore protection, Floats, Barriers, Coastal structures, Ocean waves.
Identifiers: *Tethered floats, Wave attenuation, Ballast.

An investigation was undertaken to determine if a limiting relationship exists between the float diameter and the length of the ballast section in the beam direction. In a random sea, the ballast/float assembly attempts to follow the sea surface variations and to move towards an equilibrium between buoyant and inertial forces. Assuming a large number of floats per rigid ballast section, a fixed ballast length (B), and a constant volume of floats independent of float diameter (D), the attitude of the ballast can be considered to be nearly independent of float diameter. It was concluded under conditions of limited fetch and short wave lengths, selection of small float diameters and reasonable ballast lengths could result in a critical condition. Under ocean wave conditions, with the float diameters presently anticipated, the ballast section lengths required to yield a critical condition would far exceed the limits imposed by bending strength, handling and logistics. Therefore, it can be concluded that D/B ratio does not present a realistic design restraint on the tethered float breakwater except for smaller scale applications. (NOAA)
W77-00899

POWER FROM THE SEA,
For primary bibliographic entry see Field 3E.
W77-00977

8D. Soil Mechanics

EVALUATION OF IN SITU SHEAR WAVE VELOCITY MEASUREMENT TECHNIQUES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
A. Viksne.
Report REC-ERC-76-6, April 1976. 40 p, 30 fig, 29 ref.

Descriptors: *Shear, Structural analysis, Borehole geophysics, *Dynamics, Earthquakes, Earth dams, Field tests, Test procedures, *Instrumentation, Elastic properties, Measurement, Embankments, *Seismic properties, Bibliographies.
Identifiers: Borehole probe, *Shear waves.

Several geophysical methods used by the Bureau of Reclamation to obtain the in situ shear wave velocity of earth embankments were evaluated. In situ low-strain shear wave velocity determinations have been performed on a number of existing zoned earthfill dams and an earth dam under construction. These field measurements of shear wave velocity by geophysical exploration methods have become an integral part and standard procedure at the Bureau for obtaining input parameters for dynamic analyses of earth dams. In the course of shear wave velocity measurements, various borehole methods, such as downhole, crosshole, and uphole, as well as seismic refraction have been used. Shear wave velocity measurements have been performed with explosive and nonexplosive impulsive energy sources using cased and uncased test holes. The results of these field studies have not only provided input parameters for dynamic analyses, but have also provided information as to which method or combination of methods should be used to obtain optimum results. Test methods and results of the various in situ measurements are compared and evaluated. (Bur of Reclam)
W77-00737

DESIGN AND PERFORMANCE OF ROCK REVETMENT TOES,
Army Engineer District, Kansas City, Mo. Hydrologic Engineering Branch.
W. M. Linder.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976; Denver, Colorado, March 22-25, 1976. Water Resources Council, Washington, D.C., Sedimentation Committee, p 2-168 - 2-179, 1976. 5 fig, 1 tab, 1 ref.

Descriptors: *Riprap, *Erosion control, *Model studies, *Bank protection, Retaining walls, Rocks, Bank stabilization, Lakes, Rivers, Shore protection, Structures, Engineering structures, Erosion, Waves(Water), On-site investigations.
Identifiers: *Revetment toes, Rock revetments.

One of the major causes of failure of rock riprap revetments is undercutting or erosion of bank material below the base of the revetment. When this occurs, rock from the side slope migrates downward and exposes areas of unprotected bank, subjecting the entire revetment to progressive destruction. Several model and prototype tests of the performance of various shapes of revetment toes were performed. These investigations were described and conclusions were presented that can be drawn from the studies. The studies indicated that while shape was important, the volume of reserve rock provided in the revetment toe was probably more significant. Rock from a revetment toe generally migrated downward on approximately a 1Vertical on 2Horizontal slope to form a protective layer one to two rock diameters in thickness. Protection continued as long as there was sufficient rock remaining in the toe structure to prevent separation of the side-slope protection. (See also W77-00775) (Sims-ISWS)
W77-00807

8G. Materials

SCALE INHIBITION AND COMPOUNDS THEREFORE,
Nalco Chemical Co., Oak Brook, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W77-00686

LABOR/-TORY AND FIELD INVESTIGATIONS OF NEW MATERIALS FOR ROOF CONSTRUCTION (PROGRESS REPORT),
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
B. V. Jones.
Report REC-ERC-76-4, April 1976. 58 p, 33 fig, 8 tab, 27 ref, append.

Descriptors: Rubber, *Elastomers, Polymers, *Protective coatings, Durability, Laboratory tests, *Performance tests, *Adhesives, *Roofs, Foam, Gravels, *Roofing materials, Silicone.
Identifiers: Rubber sheeting, Neoprene, Butyl rubber.

Materials properties and field performance for sprayed-in-place polyurethane foam and exposed elastomeric membrane roofing systems are presented. Field observations of a styrene foam protected membrane roofing system are discussed and system principles are reviewed. Studies of polyurethane foam systems include: effect of standing water and water vapor, freeze-thaw, system flammability, weathering and impact resistance of protective coatings, and preliminary correlation between impact test results and hail damage. Studies of exposed elastomeric membrane systems include physical properties tests, weathering, and rubber sheet-insulation board strength characteristics. Proposed criteria fo USBR roofing are presented. The sprayed-in-plac polyurethane foam and the styrene foam protecte membrane systems were found to meet th proposed criteria with the latter preferred whe design limitations will allow its use. (Bur Reclam)
W77-00736

EVALUATION OF IN SITU SHEAR WAV VELOCITY MEASUREMENT TECHNIQUES,
Bureau of Reclamation, Denver, Colo. Enginee ing and Research Center.
For primary bibliographic entry see Field 8D.
W77-00737

GAGING SEDIMENT-LADEN FLOWS WITH NOTCH WEIRS,
Agricultural Research Service, Columbia, M North Central Watershed Research.
For primary bibliographic entry see Field 2J.
W77-00845

INFLUENCE OF THE SUPRAMOLECULA MARINE ENVIRONMENT ON PITTING CO ROSION,
Texas A and M Univ., College Station. Ocean E gineering Program.
D. B. Harris, B. M. Gallaway, and J. B. Herbich.
Sea Grant Report No. TAMU-SG-76-211, Augu 1976. 49 p, 7 fig, 30 ref. Also as COE Report N 192. SG-04-5-158-19.

Descriptors: *Corrosion, *Microorganism *Pitting(Corrosion), *Halogens, Ions, Meta Estuarine environment.
Identifiers: Protista, *Pit nucleation, Passi films.

A mechanism is proposed for the process of cor sion pit nucleation in the marine environme Rupture of the passive film is described in terms its sensitivity to attack by negatively hydrat ions. A corollary is suggested which describes t inhibiting effect of various positively hydrat ions. The role of marine microorganisms discussed as it relates to those environmen modifications that may contribute to pit nucle tion. (NOAA)
W77-00890

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

FEDERAL WATER RESOURCES RESEARC PROGRAM FOR 1973 AND 1974, COMMITTE ON WATER RESOURCES RESEARCH OF TE FEDERAL COUNCIL FOR SCIENCE AN TECHNOLOGY, (1976).
For primary bibliographic entry see Field 9D.
W77-00531

9D. Grants, Contracts, and Research Act Allotments

FEDERAL WATER RESOURCES RESEARC PROGRAM FOR 1973 AND 1974, COMMITTE ON WATER RESOURCES RESEARCH OF TE FEDERAL COUNCIL FOR SCIENCE AN TECHNOLOGY, (1976).
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-595 5 $7.50 in paper copy, $3.00 in microfiche. Natio Science Foundation, Washington, D. C., 1976, 1 p, 2 append.

Descriptors: *Research and development, Wa Resources Research Act, Federal Governme

ederal budget, *Administrative agencies, ederal project policy, Projects, *Research pri-ities, Comprehensive planning, *Government pports.
entifiers: *Water Resources Research Program.

is report of the Committee on Water Resources esearch (COWRR) of the Federal Council for ience and Technology (FCST) is the Commit-e's periodic statement on the status of water sources research in the Federal Government. e period covered is two years 1973 and 1974, th agency program reports presented on a calen-r year basis and budget information on a fiscal ar basis. The last published Committee report as the Federal Water Resources Research Pro-am for 1971. The report for 1972 was not blished but is availabl from the National Techni-l Information Service, Springfied, Virginia 161 as PB 232 193. The water resources research ogram of each agency of the Government con-rned with water is reported individually. A table ts the total water resources research expendi-res by agency under the 10 FCST-COWRR tegories. In addition those expenditures are mmarized by categories and by agencies in tabu-format.
77-00531

WELFTH ANNUAL REPORT, WATER ESOURCES RESEARCH CENTER.
innesota Univ., Minneapolis. Water Resources esearch Center.
vailable from the National Technical Informa-n Service, Springfield, VA 22161 as PB-259 723, ice codes: A05 in paper copy, A01 in microfiche. illetin 88, July 1976, 81 p, 19 ref. OWRT A-999-INN(42). 14-34-0001-6024.

escriptors: *Water Resources Institute, Minnesota, Education, *Projects, Expenditures, anpower, Management, Water pollution, Water esources Research Act, *Research and develop-ent.
entifiers: Applied research.

e fiscal year 1976 budget of the Minnesota ater Resources Research Center was $271,079. e Center supported 9 research projects involv-g 9 faculty members. These research projects ere concerned with: developing a water sources research plan for Minnesota; developing dices for establishing water supply quality status d trends in Minnesota; analyses of organic car-n as a pollution index in Minnesota; bio-manipu-ion of Minnesota lakes for elimination of blue-een algae; social dimensions of water quality atus and trends in Minnesota; assessment of ater quality status and trends in Minnesota by mote sensing techniques; feasibility of using on-ore overburden material as a media for sposal of secondary sewage effluent in rtheastern Minnesota; effects of silt and turbidi-from agricultural drainage on benthic inver-brates in streams in western Minnesota; and ef-cts of drainage projects on surface runoff from etland topography of the North Central Region. bout 30 students received employment through e Center's program. During fiscal year 1976, ere were 18 reports generated through research ojects. (Waelti-Minnesota)
77-00731

). SCIENTIFIC AND TECHNICAL INFORMATION

)C. Secondary Publication And Distribution

ST OF PAPERS, 1967/1975, NTERNATIONAL ASSOCIATION FOR YDRAULIC RESEARCH).
ternational Association for Hydraulic Research, elft (Netherlands).
ril 1976. 173 p, 4 append.

Descriptors: *Publications, *Bibliographies, *Hydraulics, Fluid mechanics, Research and development, Hydraulic models, Model studies, Hydrometry, Instrumentation, Measurement, Geographical regions, Water utilization, Mathematics, Information retrieval.

Listed were 2,090 papers presented at the biennial congresses and the various symposia of the International Association for Hydraulic Research (IAHR) from 1967 through 1975. The publication was divided into four Appendixes. Appendix I listed the papers in date sequence, arranged in alphabetical order by the names of the individual authors. The various papers were divided into 9 main groups of hydraulic subjects. Each main group was then subdivided into ten more groups. Appendix II listed the 9 main groups and their subgroups. The papers were listed alphabetically by author in Appendix III. In Appendix IV, the papers belonging to the various groups shown in Appendix II were listed. Also included was a list of publications available from IAHR. (Froehlch-ISWS)
W77-00636

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reating Polluted Water.
/77-00571 5D

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/77-00874 5C

ladophora in the Great Lakes,
/77-00928 5C

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ircle Investment Co V City of Toledo (Effect f Changing Canal to Limited Access Highway n Abutting Landowners--No Access equired).
/77-01044 6E

CRETION (LEGAL ASPECTS)
tate V Ashmore (Fixing Boundaries Adjacent Tidewaters).
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OUSTICS
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/77-00628 5D

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arbon Adsorption of Air and Water Pollu- nts,
/77-00591 5F

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Iethod of Treating Waste Water,
/77-00566 5D

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/77-00606 5D

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/77-00622 5D

he Laboratory Evaluation of a Method for nhancing the Kinetics of Activated Sludge reatment Plants,
/77-00633 5D

The Effluent Treatment Plant of BASF AG in Ludwigshafen/Rhine,
W77-00742 5D

Detoxification of Bleached Kraft Mill Effluents,
W77-00754 5D

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Effects of Lime Addition on Treatment Plant Operation,
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An 'Environmental' Approach to Stormwater Management in the Adelaide Hills (Australia),
W77-00953 4A

ADHESIVES
Laboratory and Field Investigations of New Materials for Roof Construction (Progress Report),
W77-00736 8G

ADMINISTRATION
The Canada Water Act, Annual Report, 1974-1975.
W77-00916 5G

Flood Control by State in Cooperation With Federal Agencies.
W77-01007 6E

ADMINISTRATIVE AGENCIES
Federal Water Resources Research Program for 1973 and 1974, Committee on Water Resources Research of the Federal Council for Science and Technology, (1976).
W77-00531 9D

Urban Flood Warning and Watershed Management Advances in Metropolitan Melbourne,
W77-00670 6F

Wisconsin Natural Resource Use Controls and Assistance.
W77-00915 6E

Erams Surface and Drinking Water Components, January--March 1974.
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Radioactivity in Kansas Surface Waters, January--December 1972.
W77-00955 5A

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.

- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
- 6 WATER RESOURCES PLANNING
- 7 RESOURCES DATA
- 8 ENGINEERING WORKS
- 9 MANPOWER, GRANTS, AND FACILITIES
- 10 SCIENTIFIC AND TECHNICAL INFORMATION

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 10, NUMBER 3
FEBRUARY 1, 1977

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 3
FEBRUARY 1, 1977

W77-01051 -- W77-01550

etary of the U.S. Department of the Interior has de-
that the publication of this periodical is necessary in the
on of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication mats. The contents of these documents cover the water-ated aspects of the life, physical, and social sciences as ll as related engineering and legal aspects of the charac-stics, conservation, control, use, or management of water. ch abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-arch categories established by the Committee on Water sources Research of the Federal Council for Science and chnology.

RSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE OPIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-L. Sufficient bibliographic information is given to enable aders to order the desired documents from local libraries other sources.

lected Water Resources Abstracts is designed to serve scientific and technical information needs of scientists, gineers, and managers as one of several planned services the Water Resources Scientific Information Center RSIC). The Center was established by the Secretary of the erior and has been designated by the Federal Council for ience and Technology to serve the water resources com-nity by improving the communication of water-related search results. The Center is pursuing this objective by co-dinating and supplementing the existing scientific and tech-al information activities associated with active research d investigation program in water resources.

provide WRSIC with input, selected organizations with tive water resources research programs are supported as enters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
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05 WATER QUALITY MANAGEMENT AND PROTECTION
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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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10 SCIENTIFIC AND TECHNICAL INFORMATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

WATER CYCLE

. General

MPARISON OF TWO MATHEMATICAL DELS OF SURFACE RUNOFF,
/ Mexico Inst. of Mining and Technology, orro.
primary bibliographic entry see Field 2E.
-01334

LICATION OF A PARAMETRIC MODEL SIMULATE FLOWS FROM AN URBAN TERSHED,
inia Polytechnic Inst. and State Univ., ksburg. Dept. of Civil Engineering.
Harris, and V. O. Shanholtz.
5). 35 p, 12 fig, 8 tab, 14 ref.

criptors: *Parametric hydrology, *Model stu-, *Agricultural watersheds, *Urbanization, drology, Waste disposal, Pumping, Water ly, Calibrations, Computers, *Ohio.
tifiers: *Standford Watershed Model, ntucky Watershed Model, *Ottawa River ershed(Ohio).

metric watershed models, such as the Ken-y Watershed Model, have been used satisfac-y for simulating the hydrology of agricultural rsheds. With the addition of a divergent flow outing to account for direct waste discharges pumpages by municipal and industrial ces, these models can be used to predict the cts of urbanization. Utilization of the percent rvious area parameter for reflecting the ee of urban influence within the watershed been shown to be a valid approach. This od can also be used in regional planning, n information is needed concerning effects on watershed hydrology from urban growth. Ur-zation effects on the hydrologic response of Ottawa River watershed in Ohio were in-gated with the modified parametric model. gh-ISWS)
-01339

TWO-DIMENSIONAL FLOOD ROUTING DEL,
versity of the Witwatersrand, Johannesburg th Africa). Dept. of Civil Engineering.
primary bibliographic entry see Field 4A.
-01358

IGN FLOOD SYNTHESIS BY EXCESS RAIN TING,
versity of the Witwatersrand, Johannesburg th Africa). Hydrological Research Unit.
. Bauer, and D. C. Midgley.
Civil Engineer in South Africa, Vol 17 (8), p 202 (1975), Vol 15 (1), p 16, (1976). 4fig, 3 tab.

criptors: Hydrography, Rain gages, Rainfall-ff relationships, *Design flood, *Synthetic ology, *Rainfall intensity, *Precipitation ex-

tifiers: South Africa.

s of several routing procedures for hydrog-y synthesis revealed that routing of the excess hyetograph through a single linear reservoir-storage could yield a plausible direct runoff ograph provided the shape and drainage pat-of the catchment was not abnormal. The od requires evaluation of only one parameter, outing constant K, to define the hydrograph n excess rain of given depth and duration. K es were determined for 92 South African nments by seeking best-fits between routed observed unitgraphs. To aid estimation of K ngauged catchments the country was subdi-d into veld-type zones for each of which a relationship between K and area of catchment is provided. A worked example demonstrates the method. (South Africa)
W77-01452

2B. Precipitation

A TECHNIQUE FOR PREDICTING THE AQUATIC ECOSYSTEM RESPONSE TO WEATHER MODIFICATION,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 3B.
W77-01051

WAVE PREDICTION FOR THE EAST COAST OF INDIA UNDER STORM CONDITIONS IN THE BAY OF BENGAL,
Karnataka Regional Engineering Coll., Suratkal (India).
For primary bibliographic entry see Field 2L.
W77-01124

A STUDY OF HOURLY RAINFALL DISTRIBUTION AROUND MONSOON DEPRESSION CENTRE IN CENTRAL INDIA,
Regional Meteorological Center, Nagpur (India).
K. S. Venkataraman, A. Chowdhury, and A. K. Banerjee.
Indian Journal of Meteorology and Geophysics, Vol. 25, No. 2, p 239-244, April 1974. 5 fig, 2 ref.

Descriptors: *Rainfall, *Rainfall disposition, *Distribution patterns, *Asia, Precipitation intensity, Precipitation(Atmospheric), Rain, Monsoons, Rainfall intensity, Data processing, Depression, Storms, Meteorology.
Identifiers: *India, *Madhya Pradesh(India).

Average distribution of rainfall around the center of monsoon depression in separate intervals of six hours in central India was presented and discussed in this paper. The following observations were made: The area around the first 100 km of the depression center is generally free from intense rainfall activities. The heavy rainfall belt is mostly confined to the left forward quadrants of the depression field, and rainfall is most widespread in these quadrants in the third and fourth six-hour intervals, reckoned with 03 GMT. Hourly intensities of rainfall greater than 50 mm/hr, however, are more frequent during the first 6-hr interval. (Sims-ISWS)
W77-01125

DIURNAL VARIATION OF RAINFALL IN BRAHMAPUTRA VALLEY,
Meteorological Office, Nasik (India).
B. Prasad.
Indian Journal of Meteorology and Geophysics, Vol. 25, No. 2, p 245-250, April 1974. 7 tab, 5 ref.

Descriptors: *Rainfall, *Rainfall disposition, *Diurnal, *Asia, Mountains, Valley, Precipitation(Atmospheric), Precipitation intensity, Rain, Rainfall intensity, Meteorology.
Identifiers: *India, *Brahmaputra Valley(India).

A study was done of the diurnal variation of rainfall at four stations within the Brahmaptura Valley. The mean hourly monthly rainfall at the four stations was considered. It was found that a well marked diurnal variation in the rainfall exists with the maximum in the early morning hours and the minimum in the afternoon hours. It was argued that this is mainly due to the mountain winds. (Sims-ISWS)
W77-01126

A STUDY OF MAXIMUM VALUES OF WITHIN-STORM RAINFALL,
Meteorological Office, New Delhi (India).
P. S. Harihara Ayyar, and N. Tripathi.
Indian Journal of Meteorology and Geophysics, Vol. 25, No. 2, p 251-255, April 1974. 1 fig, 5 tab, 2 ref.

Descriptors: *Rainfall, *Design storm, *Probable maximum precipitation, *Asia, Duration curves, Statistics, Precipitation(Atmospheric), Excessive precipitation, Rain, Precipitation intensity, Rainfall intensity, Storms, Design flood, Weather data, Climatic data, Meteorology, Climatology.
Identifiers: *India.

It has been observed by hydrologists that the maximum flood peaks are generally produced by storms of long duration containing high intensity spells, whereas only low flood peaks are produced by short duration storms though the rainfall intensity in the storms may be higher. Hence it is advisable to take the design rainfall value of the required duration and frequency computed from the within-storm rainfall values. Design engineers often require adjustment factors for converting the among-storm rainfall value to within-storm rainfall value. For this purpose, depth-transformation curves for a 2-year return period for the Indian region were compiled and presented. For return periods of 25 years and above, the adjustment factor was found to be nearly 1.0. (Sims-ISWS)
W77-01127

DYNAMICAL ABNORMALITIES ASSOCIATED WITH DROUGHT IN THE ASIATIC SUMMER MONSOON,
Institute of Tropical Meteorology, Poona (India).
R. N. Keshavamurty, and S. T. Awade.
Indian Journal of Meteorology and Geophysics, Vol. 25, No. 2, p 257-264, April 1974. 6 fig, 1 tab, 12 ref.

Descriptors: *Droughts, *Monsoons, *Asia, Circulation, Air circulation, Precipitation(Atmospheric), Rainfall, Temperature, Air temperature, Water shortage, Meteorology, Climatology.
Identifiers: *India.

In the recent past, 1965 and 1972 were years of severe drought over India. The dynamical and thermal features of those years were contrasted with the features of a normal monsoon season. The main local abnormality during drought years is the shift of the monsoon trough northwards and development of aticyclones over central India in the lower troposphere. The main abnormality in the thermal field is that temperatures are considerably below normal over southern parts of USSR, Iran, Afghanistan, and north India. Quasi-geostrophic 'omega' was used to delineate the vertical circulations. It was seen that the north-south circulation and associated energy conversion were weaker and the east-west circulation more marked during breaks. A model of the vertical circulations during drought periods was suggested. The intensity, phase, movement, and vertical and horizontal tilts of the different wave numbers in the mid-latitudes during drought and in the preceding months were contrasted with the normal conditions. In 1972, wave Nos. 5-9 were abnormally pronounced and showed some dynamical differences. (Sims-ISWS)
W77-01128

RESULT OF OPERATIONAL CLOUD SEEDING EXPERIMENT OVER RIHAND CATCHMENT IN NORTHEAST INDIA,
Institute of Tropical Meteorology, Poona (India).
For primary bibliographic entry see Field 3B.
W77-01129

THE STUDY OF DROUGHTS BY WATER BUDGET METHOD OVER ANDHRA PRADESH,
Institute of Tropical Meteorology, Poona (India).
P. Rakhecha.

Indian Journal of Meteorology and Geophysics, Vol. 25, Nos. 3 and 4, p 411-416, July and October 1974. 6 tab, 5 ref.

Descriptors: *Droughts, *Climatology, *Water balance, Hydrologic budget, Evapotranspiration, Arid climates, Arid lands, Moisture deficit, Water shortage, Climatic data, Rainfall, Precipitation(Atmospheric), Weather, Meteorology.
Identifiers: *India, *Andhra Pradesh(India)..

Studies of droughts based on water budget method seem to provide a more realistic approach than studies based on rainfall alone. The frequency and pattern of variation of the drought situations for a group of 9 stations in Andhra Pradesh during the last 70 years were studied by computing aridity indices values from water balance considerations of Thornthwaite. From this study, it was seen that a minimum of 3-4 effective drought years may be expected over each station in a decade and that liability to drought is maximum in Nellore. An examination of the year-to-year changes in climate showed that the disastrous drought years generally became arid in nature. (Sims-ISWS)
W77-01130

GENERALIZED RELATIONSHIP BETWEEN MAXIMUM RAIN DEPTH, AREA AND RETURN PERIOD FOR MAJOR RAINSTORMS,
Institute of Tropical Meteorology, Poona (India).
O. N. Dhar, and P. Rakhecha.
Indian Journal of Meteorology and Geophysics, Vol. 25, Nos. 3 and 4, p 417-422, July and October 1974. 3 fig, 3 tab, 11 ref.

Descriptors: *Depth-area-duration analysis, *Rainfall, *Probable maximum precipitation, Analytical techniques, Depth-area curves, Duration curves, Rainfall intensity, Frequency, Storms, Meteorological data, Meteorology, Climatology.
Identifiers: *Tropical storms, *India, *Bihar region(India).

A generalized relationship among maximum rain depth, area, and return period was determined using Karoly and Alexander technique. For this purpose, major rainstorms which affected Bihar region during the 65-year period from 1897 to 1961 were analyzed, and their depth-area-duration data utilized. The 3-day relationship was found to be of the form d = -2.76 log A log T -4.08 log A + 16.03 log T + 23.73. Based on this relationship, a monogram was prepared with which maximum 3-day rain depths could be obtained for different areas and return periods. Conversion factors were also worked out for obtaining maximum rain depths for one and two-day durations for different areas and return periods. (Sims-ISWS)
W77-01131

THE RESULTANT DIRECTION AND INCLINATION OF RAINFALL AT TAITA EXPERIMENTAL STATION, NEW ZEALAND,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
R. Aldridge.
Journal of Hydrology (New Zealand), Vol. 14, No. 1, p 42-54, 1975. 10 fig, 1 tab, 11 ref.

Descriptors: *Rainfall, *Precipitation(Atmospheric), Winds, Data processing, Measurement, On-site investigations, Data collections, Monthly, Seasonal, Annual, *Rain gages.
Identifiers: *New Zealand, Vectopluviometers, Inclined rainfall, Rainfall direction.

Resultant direction and inclination of rainfall at Taita Experimental Station, Lower Hutt, New Zealand, have been computed from vectopluviometer data for the period March 1959 to December 1971. The patterns of distribution of resultant direction and inclination were described in relation to selected daily-rainfall size classes. The relationship between resultant direction and inclination of daily rainfall was related to daily and monthly windrun data. Monthly, seasonal, and annual variations of resultant direction and inclinations were described. Resultant directions of rainfall over long periods showed peaks between 200 deg and 280 deg and between 320 deg and 020 deg with the largest peak, between 200 deg and 240 deg, corresponding approximately to the orientation of the lower Hutt Valley. About 40% of the daily rainfall fell at inclinations less than 11 deg from the vertical, and about 60% at less than 21 deg. Low or high inclination of rainfall may broadly be associated with low or high windrun. Northerly and westerly exposures received the largest proportion of the rainfall, and easterly exposures the smallest. Generally, spring and summer months had the largest northerly rainfall components, and autumn the largest southerly and westerly components. Winter had the largest easterly rainfall component while retaining a large southerly component. (Sims-ISWS)
W77-01133

THE RESULTANT DIRECTION AND INCLINATION OF RAINFALL AT ARAHURA, WAIRARAPA, NEW ZEALAND,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
R. Aldridge.
Journal of Hydrology (New Zealand), Vol. 14, No. 1, p 55-63, 1975. 7 fig, 1 tab, 5 ref.

Descriptors: *Rainfall, *Precipitation(Atmospheric), *Rain gages, Winds, Data processing, Measurement, On-site investigations, Data collections, Monthly, Seasonal, Distribution, Rainfall disposition.
Identifiers: *New Zealand, Vectopluviometers, Inclined rainfall, Rainfall direction.

Resultant directions and inclinations of rainfall have been computed from vectopluviometer data taken at Arahura near Gladstone in the Wairarapa, for the period June 1967 to July 1971. The distribution of resultant direction and inclination of the daily rainfall was discussed along with the relationship between resultant direction and inclination. Monthly and seasonal variations of the resultant direction and inclination of the rainfall were presented. This study illustrated the marked predominance of southerly rainfall in this part of the Wairarapa and the rarity of northerly or westerly rainfall. Resultant inclinations of the rainfall showed that the southerly rainfall is more steeply inclined from the vertical than rainfall from other directions. (Sims-ISWS)
W77-01134

A CLIMATONOMIC STUDY OF THE LAKE ONTARIO DRAINAGE BASIN,
California Univ., Berkeley, Dept. of Geography.
For primary bibliographic entry se · Field 2H.
W77-01146

DRAFT ENVIRONMENTAL STATEMENT: PROJECT SKYWATER A PROGRAM OF RESEARCH IN PRECIPITATION MANAGEMENT, VOLUME I OF II.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-01187

IFYGL RAWINSONDE DATA ACQUISITION SYSTEM,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-01189

ORGANIC MATTER IN ATMOSPHERI PRECIPITATION IN THE VORONEZH R GION, (IN RUSSIAN),
Voronezhskii Lesotekhnicheskii Institut (USSR)
For primary bibliographic entry see Field 5B.
W77-01249

PROGRESS IN THE EXPLORATION AND THE SCIENTIFIC RESEARCH OF THE LIBYA DESERT SINCE GERHARD ROHLFS,
Stuttgart Univ. (West Germany).
For primary bibliographic entry see Field 4A.
W77-01269

THE INTERPRETATION OF RAINFALL PA TERNS IN NORTHERN YUCATAN UTILIZIN METEOROLOGICAL SATELLITE IMAGERY,
University of South Alabama, Mobile.
A. Williams.
Association of American Geographe Proceedings, Vol 8, p 15-19, 1976. 4 fig, 7 ref.

Descriptors: *Rainfall, *Meteorological da *Thunderstorms, *Sea breeze *Precipitation(Atmospheric), *Satellites(Artificial), Data collections, Topo raphy, Karst, Air masses, Orography, Clima data, *Mexico.
Identifiers: *Yucatan Peninsula(Mexico).

The relationship between the thunderstor anomalous rainfall pattern of the Karst Plain of t Yucatan Peninsula and the use of weather satell imagery to assist in establishing this relationsh are discussed. Conventional climatological da for Yucatan are inadequate. Thus, satell imagery is utilized. The maximum rainfall anoma of the northeast Karst Plain results from the co vergence of two sea breezes, one from the Gulf Mexico, one from the Caribbean. This 'double breeze effect' creates an area of intense conv gence and the subsequent development of n merous thunderstorms resulting in 40 inches more of rainfall a year. Without the assistance satellite imagery, the documentation of this eve would have been possible only with extensive s face instrumentation. The northwest coast of Y catan is more arid than the eastern portion, aver ing from 15 to 30 inches of rainfall per year. T entire peninsula shares a dry winter, thus summ atmospheric circulation accounts for the d ference. The conclusion is that a single sea bree inhibits thunderstorm development along t northwest coast and therefore contributes to semi-arid climate. (Jamail-Arizona)
W77-01280

RAINFALL AND FLOODS IN INDIA DURI 1973 SOUTHWEST MONSOON PERIOD,
Meteorological Office, New Delhi (India).
S. D. S. Abbi, M. R. Nagasubramanian, and B. C Jain.
Indian Journal of Meteorology and Geophysi Vol. 25, Nos. 3 and 4, p 363-370, July and Octob 1974. 2 fig, 3 tab.

Descriptors: *Rainfall, *Climatic da *Monsoons, Precipitation excess, Floo Weather data, Meteorological data, Precipi tion(Atmospheric), Depth-area curves, Rainfall tensity, Excessive precipitation, Isohyets, C matology, Meteorology.
Identifiers: *India.

Rainfall during the 1973 southwest monso period was more or less normal over the count It was in excess in Punjab, Jammu and Kashm Rajasthan, west Madhya Pradesh, and Gujarat R gion. Rainfall was deficient only over coastal An hra Pradesh where it was -27%. The characteris feature of the 1973 monsoon period was the occ rence of excessive rainfall in west Rajasthan a west Madhya Pradesh in August, leading to se ous floods. The percentage departures of t southwest monsoon rainfall week-by-week in t

meteorological subdivision of India were given. e progress of the monsoon from 1 June depict- the percentage departures from normal of the nulative rainfall for the successive weeks was ulated. Also, the salient features of the rainfall tribution were presented. (Sims-ISWS)
7-01329

MMENTS ON THE STORAGE OF WATER POUR IN THE ATMOSPHERE OVER UTH AFRICA,
tal Univ., Pietermaritzburg (South Africa).
S. McGee.
ter SA., Vol 1(1), p 30-35, (1975). 5 fig, 3 tab, 15

scriptors: *Water storage, Meteorology, Rain-, *Water vapor, Precipitation(Atmosplheric), mate data, *Atmosphere, Africa.
ntifiers: *South Africa.

an monthly values of precipitable water vapour l mean daily rainfall data for each month over a -year period at six stations (and at one locality a five-year period) are examined to determine space and time patterns of atmospheric water our storage over South Africa. From the ults it may be inferred that precipitation is re- d more to the field of convergence of at- spheric water vapour than to the water vapour tent per se and that the moisture content of the osphere cannot as yet be harnessed as an auxil- y source of water supply (South Africa)
7-01365

SIGN FLOOD SYNTHESIS BY EXCESS RAIN UTING,
iversity of the Witwatersrand, Johannesburg uth Africa). Hydrological Research Unit.
r primary bibliographic entry see Field 2A.
7-01452

C. Snow, Ice, and Frost

GANIC MATTER IN ATMOSPHERIC ECIPITATION IN THE VORONEZH RE- ON, (IN RUSSIAN),
ronezhskii Lesotekhnicheskii Institut (USSR).
r primary bibliographic entry see Field 5B.
7-01249

OMALOUS LOCAL GLACIER ACTIVITY, FFIN ISLAND, CANADA: PALEOCLIMATIC PLICATIONS,
lorado Univ., Boulder. Inst. of Arctic and Al- e Research.
H. Miller.
ology, Vol. 4, No. 8, p 502-504, August 1976. 2 14 ref. NSF GA-41562.

scriptors: *Glaciers, *Paleoclimatology, nada, *Arctic, Dating, Radioactive dating, Cli- tology, Glacial sediments, Ice, Cirques, Glacial t, Precipitation(Atmospheric), Glaciology.
ntifiers: *Baffin Island(Canada).

ne local cirque glaciers on eastern Baffin Island re more extensive during the 'Little Ice Age' n at any time in at least the past 34,000 yr and sibly the past 60,000 yr. The most reasonable eoclimatic explanation of such anomalous gla- r activity is that during the last glacial maximum southern Canada, Arctic regions experienced inished precipitation. (Sims-ISWS)
7-01333

OWMELT LYSIMETERS PERFORM WELL COLD TEMPERATURES IN CENTRAL LORADO,
est Service (USDA), Fort Collins, Colo. Rocky untain Forest and Range Experiment Station.
W. Schultz.
Research Note RM-247, September 1973, 8 p, 8 fig, 9 ref.

Descriptors: *Lysimeters, Snow management, *Snowmelt, *Colorado, Temperature, Measurement, Instrumentation.

Comparison between lysimeter and snow-tube measurements of melt rates indicated that the lysimeters provided reliable measurements of snowmelt. The lysimeter frame did not noticeably affect the thermal regime of the snow within the lysimeter. (Forest Service)
W77-01432

2D. Evaporation and Transpiration

THE STUDY OF DROUGHTS BY WATER BUDGET METHOD OVER ANDHRA PRADESH,
Institute of Tropical Meteorology, Poona (India).
For primary bibliographic entry see Field 2B.
W77-01130

A CLIMATONOMIC STUDY OF THE LAKE ONTARIO DRAINAGE BASIN,
California Univ., Berkeley, Dept. of Geography.
For primary bibliographic entry see Field 2H.
W77-01146

THE MEASUREMENT OF WATER LOSSES FROM A FORESTED AREA USING A 'NATURAL' LYSIMETER,
Institute of Hydrology, Wallingford (England).
I. R. Calder.
Journal of Hydrology, Vol. 30, No. 4, p 311-325, 1976. 7 fig, 2 tab, 12 ref.

Descriptors: *Lysimeters, *Water loss, *Forests, *Evaporation, Interception, Transpiration, Forest management, Runoff, Water balance, Soil moisture, Rainfall, On-site investigations.
Identifiers: *Natural lysimeter, *Forested area, *Wales, *Potential evaporation, *Forest canopy, *Upper Severn River, Catchment, Field measurement, Water balance equation.

Water losses due to transpiration and evaporation of intercepted water were measured using a 'natural' lysimeter in the Hafren forest of central Wales. Then, they were compared with estimates of potential evaporation calculated from meteorological observations. Given certain assumptions concerning the forest canopy, the lysimeter observations were used to estimate runoff from the experimental catchment of the Upper Severn, within which the lysimeter was sited. This estimate agreed well with the observation. The annual loss recorded at the lysimeter, amounting to twice Penman E sub o, demonstrated the magnitude of the evaporation losses that arise from forests in a high-rainfall area. The total losses estimated for the Severn experimental catchment as a whole were significantly less, owing to the relatively small percentage of the total catchment area with canopy coverage and the consequent reduction in the interception loss. Interception was a major loss component in this high-rainfall area and underlined the need for accurate methods of measuring and predicting interception losses from similar areas. (Roberts-ISWS)
W77-01148

WATER SALVAGE POTENTIALS IN UTAH, VOLUME II, EVAPORATION SUPPRESSION BY RESERVOIR DESTRATIFICATION,
Utah Water Research Lab., Logan.
T. C. Hughes, E. A. Richardson, and J. A. Franckiewicz.
Report No. PRWA22-2, June 1975. 84 p, 21 fig, 16 tab, 32 ref, 9 append.

Descriptors: *Water quality control, *Evaporation, *Reservoirs, *Destratification, *Temperature, Cooling, *Utah, Regression analysis, Costs, Estimating, Environment, Benefits, Hypolimnion, Conservation, River basins, Research, Mixing, Mathematical models, Systems analysis, Forecasting.
Identifiers: *Suppression model, Mechanical pumping, Compressed air, *Water salvage.

A model is developed for predicting evaporation suppression due to the surface cooling effect of reservoir destratification. The model is based upon measured temperature profiles at a sample of ten Utah reservoirs. Regression analysis is then used to extend the results to all other deep reservoirs in Utah. Both suppression amounts and costs are estimated for each reservoir. The use of thermal mixing by either mechanical pumping or compressed air appears to have important potential for evaporation suppression on deep reservoirs. This concept does not involve many of the problems associated with monolayer suppression. It is independent of wind; it does not produce a concentration of excess heat near the surface; it provides a mechanism for net suppression on an annual rather than only a seasonal basis (warmed outflow); and it does not involve environmental problems associated with adding chemicals to the reservoir surface. There are, in fact, several environmental benefits claimed for the destratification procedure. Significant improvement in dissolved oxygen (DO), taste and odor, algae production, and many other quality parameters occur in the hypolimnion water. In addition to these human related benefits, fish habitat may be improved both in the reservoir (because of increased DO) and downstream from it. A major potential for water conservation in general and water energy production and salinity control in particular exists at Lake Powell. (Bell-Cornell)
W77-01164

EVAPORATION MEASUREMENTS WITH A SELF-RECORDING EVAPORIGRAPH,
Meteorological Office, Poona (India).
S. K. Shaha, P. S. Batar, and R. R. Kelkar.
Indian Journal of Meteorology and Geophysics, Vol. 25, Nos. 3 and 4, July and October 1974. 5 fig, 1 tab, 3 ref.

Descriptors: *Evaporation, *Evaporimeters, *Measurement, *Statistics, Evaporation pans, Water loss, On-site investigations, Diurnal, Instrumentation, Rates, Data processing, Climatology.
Identifiers: *India, *Evaporigraph.

Data collected over five years (1967-71) with a self-recording evaporigraph at the Central Agricultural Meteorological Observatory in Poona, were analyzed and discussed. The afternoon three-hour period 1330-1630 IST was found to contribute as much as 24 to 30% of the total daily evaporation recorded in any month; whereas the fifteen-hour period 1930-1030 IST accounted for only 26 to 41% of the total daily evaporation. A statistical analysis of evaporigraph data in comparison with Class A Pan evaporimeter measurements was also presented. (Sims-ISWS)
W77-01331

AN EVAPORATION EQUATION FOR AN OPEN BODY OF WATER EXPOSED TO THE ATMOSPHERE,
Auburn Univ., Ala. Dept. of Mechanical Engineering.
J. S. Goodling, B. L. Sill, and W. J. McCabe.
Water Resources Bulletin, Vol. 12, No. 4, p 843-853, August 1976. 3 fig, 10 ref.

Descriptors: *Evaporation, *Forced drying, *Wind velocity, Temperature, Air, Heat flow, Winds, Mass transfer, Equations, Air temperature, Numerical analysis, Mathematical studies.
Identifiers: *Natural evaporation, *Forced evaporation, Evaporation equation, Evaporative heat flux, Lake stratification, Cooling ponds, Mass transport.

Evaporation was identified as having two additive components: natural evaporation in the absence of wind, and forced evaporation in the presence of wind. An evaporation equation was obtained for an open body of water exposed at the atmosphere by conversion of standard, horizontal flat plate heat transfer relationships to a mass transfer or evaporation equation, based on an average air temperature of 68F. A comparison of numerical values predicted by this equation was made with evaporation equations deduced from field measurements, and the agreement was favorable. The major differences between this equation and those previously developed were: (1) This equation was derived strictly from standard heat transfer expressions, and (2) A dependency of average fetch and air temperature (through transport properties) was shown. This approach established the correct dependencies of the field parameters so that future experimental measurements would have a sound theoretical basis. (Roberts-ISWS)
W77-01338

LEAF DIFFUSION RESISTANCE TO WATER VAPOUR AND ITS DIRECT MEASUREMENT,
Agricultural Univ., Wageningen (Netherlands). Lab. of Physiological Meteorology.
C. J. Stigter, J. Birnie, and B. Lammers.
Meded Landbouwhogesch Wageningen. 73(15), p 1-55, 1973.

Descriptors: *Leaves, *Drought resistance, *Instrumentation, *Measurement, *Evaporimeters, Water vapor.
Identifiers: *Porometer resistance.

The design and calibration of an improved leaf diffusion resistance meter is described. A value for porometer resistance was derived theoretically from geometrical considerations and transport phenomena which was in good agreement with measured values. An accurate measuring procedure was designed using accurate digital indication of charges in sensor resistance. Three fixed electrical resistance values were used to obtain a short and long transient time, the ratio of the 2 making it possible to collect information on the possible influence of the measuring device on the state of opening of the stomata. (See also W73-10703)--Copyright 1975, Biological Abstracts, Inc.
W77-01378

ALLOCATION OF WATER TO FORESTRY AND OTHER USERS IN THE CATCHMENT OF THE EERSTE RIVER,
Jonkershoek Forest Research Station, Stellenbosch (South Africa).
For primary bibliographic entry see Field 4D.
W77-01385

CATCHMENT RESEARCH AT ZACHARIASHOEK,
Jonkershoek Forest Research Station, Stellenbosch (South Africa).
For primary bibliographic entry see Field 4D.
W77-01386

SIMULATION OF EVAPOTRANSPIRATION AND DRAINAGE FROM MATURE AND CLEAR-CUT DECIDUOUS FORESTS AND YOUNG PINE PLANTATION,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
L. W. Swift, Jr, W. T. Swank, J. B. Mankin, R. J. Luxmoore, and R. A. Goldstein.
Water Resources Research, Vol 11, No 5, p 667-673, October 1975. 3 fig, 7 tab, 23 ref.

Descriptors: *Model studies, *Simulation analysis, *Evapotranspiration, *Forest management, *Water yield, Water yield improvement, Transpiration, Interception, Soil-water-plant relationships, Soil moisture, Soil water, Clear-cutting, Reforestation, Vegetation regrowth, Watershed management, North Carolina, Tennessee, Drainage.

Prosper, a phenomenological model of water exchange between soil, plant, and atmosphere, was used to simulate evapotranspiration and annual drainage for 2 years from a mature oak-hickory forest in the southern Appalachians. The simulation was tested by comparing drainage to measured streamflow. In a year of unusually high precipitation the simulated annual drainage was within 1.5% of measured streamflow. Simulations were also performed by using the same 2 years of meteorologic data, but vegetation parameters were changed to represent a young white pine plantation and a regrowing hardwood forest 1 year after clear-cutting. The model estimated that drainage for an average rainfall year was reduced 20 cm by a 16-year-old white pine plantation and increased 36 cm by clear-cutting. These results were comparable to changes of -20 and +38 cm observed in watershed experiments at Coweeta Hydrologic Laboratory. Simulated evapotranspiration during the summer was nearly identical for hardwood and pine forests, while winter and early spring water loss was greater for pine. Simulation suggests that the greater evapotranspiration by pine was due to increased interception in all seasons and increased transpiration in the dormant season. For the clear-cut area, simulated evapotranspiration was considerably less than it was for the pine or hardwood forest and thus caused simulated soil moisture contents to be greater during the summer season. (Forest Service)
W77-01424

MULCH AND MICROCLIMATE: THE SIGNIFICANCE OF MULCH AND THE CHANGE IN TEMPERATURE BEHAVIOR RESULTING FROM IT, (IN DUTCH),
Agricultural Univ., Wageningen (Netherlands). Lab. of Physics and Meteorology.
For primary bibliographic entry see Field 2G.
W77-01447

RESULTS OF THE MULTIPLE CATCHMENT EXPERIMENTS AT THE JONKERSHOEK RESEARCH STATION, SOUTH AFRICA. 2. INFLUENCE OF PROTECTION OF FYNBOS ON STREAM DISCHARGE IN LANGRIVIER,
Jonkershoek Forest Research Station, Stellenbosch (South Africa).
For primary bibliographic entry see Field 4D.
W77-01474

2E. Streamflow and Runoff

A REVISED REGIONAL FREQUENCY CURVE FOR THE YARRA CATCHMENT ABOVE WARRANDYTE (AUSTRALIA).
Melbourne and Metropolitan Board of Works (Australia), Water supply, Sewerage and Drainage Branch.
For primary bibliographic entry see Field 4A.
W77-01068

THE MERRI CREEK FLOOD, 15-16 MAY 1974; CITIES OF NORTHCOTE BRUNSWICK (AUSTRALIA),
Melbourne and Metropolitan Board of Works (Australia). Main Drainage Div.
C. T. Earl.
Melbourne, 1974. 42 p, 3 tab, append.

Descriptors: *Flood damage, *Flood plains, *Legal aspects, *Historic floods, *Australia, Flood peak, Flood data, Flood control, Suburban areas, Urban drainage, Riparian land, City planning.
Identifiers: *Merri Creek(Vic), Melbourne(Vic).

The Merri Creek, Victoria, Australia, is a major tributary of the Yarra River, draining a catchment of 153 square miles of rural and urban lands. T flood described was of at least equal magnitude the highest recorded since the commencement records in 1891, and severely affected several h dred properties in suburban Melbourne. The port includes details of associated catchment ra fall, peak levels of flooding and the time of tra of the peak. The history of development of flood plain is traced, and it is shown that not o contemporary statutes relating to flood plain s division, but also some fundamental tenets of relevant Common Law, have at times b ignored. Attention is drawn to the potential eff of developments currently planned for the a (particularly a major freeway), and recommen tions for immediate and long-term flood alleviat works are provided. (CSIRO)
W77-01069

COMPRESSION OF TIME-SERIES DATA,
Ministry of Works, Wellington (New Zealar Water and Soil Div.
For primary bibliographic entry see Field 7C.
W77-01132

RAINFALL AND FLOODS IN INDIA DURI 1973 SOUTHWEST MONSOON PERIOD,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2B.
W77-01329

COMPARISON OF TWO MATHEMATIC MODELS OF SURFACE RUNOFF,
New Mexico Inst. of Mining and Technolo Socorro.
V. P. Singh.
Hydrological Sciences Bulletin, Vol. 21, No. 2 285-299, June 1976. 12 fig, 6 tab, 16 ref.

Descriptors: *Mathematical models, *Model s dies, Runoff, Surface runoff, Discharge, Agric tural watersheds, Terracing, Kinetics, P discharge, Hydrographs.
Identifiers: *Surface runoff models, Agricultu basins, Terraced basins, Linear model, Natu agricultural basins, Kinematic wave model.

A comparative assessment of two mathemat models of surface runoff was made by apply them to 21 terraced and unterraced natural agric tural basins located in two geographically differ regions. The models included a nonlinear ki matic wave model based on the converging sect geometry and Nash's linear model (NASH). T criteria for comparison included prediction hydrograph peak, hydrograph peak time and entire hydrograph, and some elementary statist tests. It was shown that converging sect geometry had a tendency to overpredict both p discharge and its time of occurrence, while NA had a tendency to underpredict them. It was s shown that because of its nonlinear charact converging section geometry was more sensit to errors in the input than NASH was. Furth more, one model could not be uniformly be than the other. It was concluded that the choice a particular model depends on the criterion comparison. (Roberts-ISWS)
W77-01334

APPLICATION OF A PARAMETRIC MOD TO SIMULATE FLOWS FROM AN URB WATERSHED,
Virginia Polytechnic Inst. and State Un Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-01339

GEOMETRY OF RIVER MEANDERS,
University of East Anglia, Norwich (Englar School of Environmental Sciences.
R. D. Hey.
Nature, Vol. 262, No. 5568, p 482-484, Aug 1976. 3 fig, 1 tab, 7 ref.

scriptors: *Meanders, *Geomorphology, avelengths, *Turbulence, *Eddies, Hydraulics, merical analysis, Hydrologic data, Channel w, Europe.
ntifiers: *Wye and Tweed Rivers(UK), Yalin's ations, Meander angle.

ere are many factors affecting the geometry of er meanders. On the basis of theoretical analy- Yalin related the wavelength of the meanders he width, w, of the channel as 2 pi times w for ly developed turbulent flow. Leopold and Wol- n's equations for the wavelength and radius of vature for the meanders were shown not to fit observed data for the Wye and Tweed rivers in United Kingdom. Introduction of the meander angle in the relation between wavelength and nel width allows satisfactory fit of the data. e constat of proportionality in Yalin's equation ds to be twice the value because the average e of the macroturbulent eddy is half the channel lth. Sinuosity is probably the best measure to ine the plan geometry of river channels for ign purposes. Arc length is shown to be a que function of channel width, which in turn is ined by the bank competence equations. ngh-ISWS)
7-01340

TON DAM FLOOD OF JUNE 1976, MORE- ND QUADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
r primary bibliographic entry see Field 7C.
7-01395

TON DAM FLOOD OF JUNE 1976, FIRTH ADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
r primary bibliographic entry see Field 7C.
7-01396

TON DAM FLOOD OF JUNE 1976, ROSE ADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
r primary bibliographic entry see Field 7C.
7-01397

TON DAM FLOOD OF JUNE 1976, MENAN TTES QUADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
r primary bibliographic entry see Field 7C.
7-01398

TON DAM FLOOD OF JUNE 1976, NEW- LE QUADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
r primary bibliographic entry see Field 7C.
7-01399

TON DAM FLOOD OF JUNE 1976, PARKER ADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
r primary bibliographic entry see Field 7C.
7-01400

TON DAM FLOOD OF JUNE 1976, ACKFOOT QUADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
r primary bibliographic entry see Field 7C.
7-01401

TON DAM FLOOD OF JUNE 1976, PINGREE ADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
r primary bibliographic entry see Field 7C.
7-01402

TON DAM FLOOD OF JUNE 1976, MOODY ADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-01403

TETON DAM FLOOD OF JUNE 1976, REXBURG QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-01404

TETON DAM FLOOD OF JUNE 1976, RIGBY QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-01405

TETON DAM FLOOD OF JUNE 1976, LEWISVILLE QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-01406

TETON DAM FLOOD OF JUNE 1976, WOODVILLE QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-01407

TETON DAM FLOOD OF JUNE 1976, ST. ANTHONY QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-01408

TETON DAM FLOOD OF JUNE 1976, DEER PARKS QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-01409

TETON DAM FLOOD OF JUNE 1976, IDAHO FALLS SOUTH QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-01410

TETON DAM FLOOD OF JUNE 1976, IDAHO FALLS NORTH QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W77-01411

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN--VOLUME 1. OHIO RIVER BASIN ABOVE KANAWHA RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-01412

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-01413

STATISTICAL ANALYSIS OF WATER-LEVEL SPRINGFLOW, AND STREAMFLOW DATA FOR THE EDWARDS AQUIFER IN SOUTH-CENTRAL TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W77-01417

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W77-01419

MAXIMUM PEAK FLOW FOR SELECTED RETURN PERIODS FOR WATERSHEDS WEST OF THE CONTINENTAL DIVIDE IN IDAHO AND MONTANA,
Forest Service (USDA), Ogden Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-01435

FLOOD PROBLEMS IN UTTAR PRADESH,
Irrigation Commission, Lucknow (India).
A. C. Chaturvedi.
The Civil Engineer in South Africa, Vol 17 (10), p 267-269, 321 (1975), Vol 17 (12), p 321, (1975). 1 fig, 1 tab.

Descriptors: *Flood control, Flood damage, *Flood forecasting, Financing, Future planning, Maintenance.
Identifiers: *India, *Uttar Pradesh.

Flood problems in Uttar Pradesh, the largest state in India are discussed. Attention is given to the rainfall pattern, flood damage, past measures, execution of flood works, flood forecasting, future measures contemplated, financing of flood works and proposed maintenance of flood works. (South Africa)
W77-01450

2F. Groundwater

HYDROGEOLOGY OF THE QUATERNARY AND TERTIARY FORMATIONS ALONG THE SOUTH COAST OF THE ALGARVE PORTUGAL,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
H. Speelman, and H. Ryckborst.
Hydrological Sciences Bulletin, Vol 21, No 2, p 345-356, June 1976. 8 fig, 2 tab, 7 ref.

Descriptors: *Hydrogeology, *Areal hydrogeology, *Aquifers, Groundwater, Coasts, Saline water intrusion, Geology, Wells, Transmissivity, Hydraulic conductivity, Tidal effects, Water levels, Model studies, On-site investigations, Water quality.
Identifiers: *Portugal.

Excessive groundwater withdrawal along the South coast of Portugal threatens the continued existence of the freshwater supply. The heavy pumping of groundwater is induced partly by the spectacular growth of the tourist industry since 1968 and partly by the new irrigation techniques for the citrus industry. In order to assess the present freshwater situation, a study was carried out in which the Quarteira area was selected as a representative zone for the southern part of the Province of Algarve. It was found that the Quaternary and Tertiary deposits on the south coast of Portugal are distinguished by their excellent aquifer characteristics. The transmissivity of the Pleistocene-Pliocene formations reaches a maximum of 1550 sq m/d. In comparison the Miocene deposits are fairly good aquifers with a transmissivity of about 270 sq m/d. Among the Holocene deposits, the barrier dunes show reasonably good water-bearing qualities. The good hydraulic conductivities (19-22 m/d) result in a flat shape of the groundwater table and freshwater flows towards the ocean. Excessive groundwater withdrawal has caused seawater intrusion. The locations of the seawater intrusions correspond with those centers where a spectacular growth of the tourist industry has taken place since 1968, and also with those

areas where new developments in the irrigation techniques for the citrus industry have been applied. On the ocean front where seawater intrusion occurs, the thickness of the freshwater lens has been reduced to 27-32 m. (Sims-ISWS)
W77-01136

HYDRODYNAMICS OF PERCHED MOUNDS,
California State Univ., Fullerton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-01141

UNSTEADY GROUNDWATER FLOW BENEATH STRIP OCEANIC ISLANDS,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
M. P. Anderson.
Water Resources Research, Vol. 12, No. 4, p 640-644, August 1976. 7 fig, 24 ref.

Descriptors: *New York, *Groundwater movement, *Model studies, Groundwater, Dupuit-Forchheimer theory, Wells, Hydrographs, Freshwater, Groundwater recharge, Hydrology.
Identifiers: *Ocean Island, *Long Island(NY), Continuously moving interface model, Delayed interface response model, Salt water.

Two one-dimensional models based on the Dupuit-Forchheimer assumptions to simulate flow beneath strip oceanic islands were presented. A model which was here designated the continuously moving interface (CMI) model was solved by finite differences. The solution agreed well with an analytical solution for a particular case given by Collins (1976). Because of its long response time, the CMI model was not able to simulate short-term fluctuations in water level in a well located on the South Fork of Long Island, New York. A second model, designated the delayed interface response (DIR) model, could reproduce the average hydrograph of the well and the decline in water level during most of an extended drought. However, because the model required discontinuous movement of the interface between freshwater and salt water, some error was introduced into the solutions. The DIR model was used to predict the response of water levels to modifications in recharge patterns on the South Fork of Long Island. (Lee-ISWS)
W77-01143

NITRATE AND CHLORIDE POLLUTION OF AQUIFERS: A REGIONAL STUDY WITH THE AID OF A SINGLE-CELL MODEL,
Tahal-Water Planning for Israel, Ltd. Tel-Aviv.
For primary bibliographic entry see Field 5B.
W77-01145

REDUCTION OF POROSITY BY PRESSURE SOLUTION: EXPERIMENTAL VERIFICATION,
Stanford Univ., Calif. Dept. of Geophysics.
E. S. Sprunt, and A. Nur.
Geology, Vol. 4, No. 8, p 463-466, August 1976. 5 fig, 10 ref. NASA NSG-7117.

Descriptors: *Porosity, *Pressure, *Sandstones, Pores, Stress, Laboratory tests, Hydrostatic pressure, Particle size, Rocks, Groundwater, Geology.
Identifiers: *Pressure solution.

Under nonhydrostatic stress, the porosity of water-saturated St. Peter sandstone was reduced by more than 50% through pressure solution. The rate of porosity reduction was dependent on the pore fluid pressure. Hydrostatic pressure alone resulted in no porosity reduction, which indicates that shear stress is necessary for the reduction of porosity by pressure solution. (Sims-ISWS)
W77-01332

A SIMPLE COMPUTER PROGRAM FOR THE DETERMINATION OF AQUIFER CHARACTERISTICS FROM PUMP TEST DATA,
Southwest Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 7C.
W77-01337

COMPARATIVE EFFICIENCY OF GEOPHYSICAL PROSPECTING TECHNIQUES IN WATER-SATURATED SANDS,
National Physical Research Lab., Pretoria (South Africa).
P. F. Worthington.
Water SA., Vol 1(1), p 9-14, (1975). 2 fig, 2 tab, 17 ref.

Descriptors: *Saturated soils, *Resistivity, *Seismic properties, Aquifers, *Exploration, Water resources, Water quality, Geophysics, *Sands.

A critical appraisal is made of the relative usefulness of the electrical resistivity and seismic refraction methods in detailed exploration of arenaceous aquifers. It is demonstrated that both techniques are useful in the mapping of aquifer boundaries although the field procedure for the refraction method is more complex. Seismic refraction is more useful in locating the water-table, but the mapping of water quality necessarily uses electrical resistivity. The accuracy of measurement of formation resistivity factor and compressional wave velocity is considered with regard to the prediction of effective porosity and intergranular permeability. It is concluded that the formation resistivity factor is a significantly better indicator of both these hydrological parameters. Thus the resistivity method should be the prime tool in the geophysical exploration of arenaceous aquifers with seismic refraction having a supporting but nevertheless important role. (South Africa)
W77-01361

GEOPHYSICAL EXPLORATION FOR POTABLE GROUNDWATER SUPPLIES IN THE KALAHARI GEMSBOK NATIONAL PARK,
Ruker (Richard) and Associates, Bryanston (South Africa).
For primary bibliographic entry see Field 4B.
W77-01366

GROUND-WATER DATA FOR THE SANTA MARIA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W77-01415

STATISTICAL ANALYSIS OF WATER-LEVEL SPRINGFLOW, AND STREAMFLOW DATA FOR THE EDWARDS AQUIFER IN SOUTH-CENTRAL TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W77-01417

ESTIMATED GROUNDWATER YIELD FOLLOWING STRIP CUTTING IN PINE PLANTATIONS,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W77-01426

HYDROGEOLOGICAL AND GEOPHYSICAL INVESTIGATIONS OF A GEOTHERMAL ANOMALY IN HUNGARY; II. GEOTHERMAL FLOW SYSTEM IN THE TISZAKECSKE REGION,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4B.
W77-01436

PINPOINTING BOREHOLES ELECTRICALL
Construction in Southern Africa, Vol 20 (7), p 79, (1975).

Descriptors: Water wells, *Boreholes, Grou water resources, *Resistivity, Hydrogeology.
Identifiers: South Africa, *South West Africa.

According to the Geophysics Division of CSIR's National Physical Research Laborat the experimental use of electrical soundings pinpointing water is showing highly encourag results, even in the arid northern areas of So West Africa. The technique is based on the t that different geological formations often have fering electrical resistivities, which can now determined by passing a current through ground between two electrodes and measuring resulting potential difference between a furt pair. (South Africa)
W77-01448

EVALUATION OF GEO-HYDROLOGIC CO STANTS FOR THE FAR WEST RA DOLOMITIC FORMATIONS,
University of the Witwatersrand, Johannesb (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-01449

2G. Water In Soils

PERCOLATION OF SURFACE-APPLI WATER IN THE FIELD,
Kentucky Agricultural Experimental Station, L ington.
V. L. Quisenberry, and R. E. Phillips.
Soil Science Society of America Journal, Vol No 4, p 484-489, July-August 1976. 10 fig, 10 ref

Descriptors: *Percolation, *Soil water moveme *Soils, *Irrigation, Chlorides, Tracers, Unsa rated flow, Groundwater movement, Infiltrati Percolating water, Porosity, Soil moisture, S water, Topsoil, Loam, Clay loam, Rainf Agriculture.

Percolation of surface-applied water tagged w chloride was studied in Maury silt loam Huntington silty clay loam under field conditio Soil samples were taken in small increments to 90-cm depth several times following application water. Analyses of chloride content with depth dicated the position of the applied water relative the initial soil water in the profile. Three perco tion studies were conducted on Maury silt lo soil. In the first study, an application of 4.2-cm water increased the water content to the 60- depth within 1 hour following irrigation ev though the volumetric water profile averaged below the upper limit of the water holding capac through this depth. A second study conducted a slightly higher initial water content showed t 20% of a 4.2-cm application had penetrated bel the 90-cm depth immediately after application a 40% penetrated below this depth within 1 ho Similar results were measured in Huntington si clay loam. Simulated rainfall increased the wa content significantly to approximately the 15- depth in each of three studies. A large percentag of the water passing this depth apparently perc lated past the 90-cm depth with very little adso tion of water and chloride between these depth Location of chloride in the profile and movem of chloride past the 90-cm depth indicated tha large percentage of the applied water percolat past the water initially present with little displa ment of the initial water. (Sims-ISWS)
W77-01137

COUPLING PHENOMENA IN SATURATI HOMO-IONIC MONTMORILLONITE: I. E PERIMENTAL,
Guelph Univ. (Ontario). Dept. of Land Resour Science.

E. Elrick, D. E. Smiles, N. Baumgartner, and P. Groenevelt.
l Science Society of America Journal, Vol 40, 4, p 490-491, July-August 1976. 3 fig, 2 ref.

scriptors: *Clays, *Montmorillonite, *Soil ysical properties, *Soil water movement, Pres-e, Salts, Sodium chloride, Electrical properties, ctrochemistry, Membranes, Laboratory tests, l water, Groundwater, Soil science.

eries of experiments was performed to observe effects of salt concentration differences across hin layer of homo-ionic montmorillonite. The ter pressure difference, concentration dif-ence, and voltage difference measured with ctrodes reversible to the anion were observed functions of time. A qualitative explanation of observations was proposed. (Sims-ISWS)
7-01138

ATER TRANSPORT IN THE SOIL-ROOT STEM: TRANSIENT ANALYSIS,
burn Univ., Ala. Dept. of Civil Engineering.
I. Molz.
ter Resources Research, Vol. 12, No. 4, p 805-, August 1976. 2 fig, 27 ref.

scriptors: *Soil water movement, *Root zone, oot systems, *Equations, Soils, Unsteady flow, tential flow, Numerical analysis, Hydraulic dient, Available water, Mathematical models, eoretical analysis, Boundaries(Surfaces), lem, Plant tissues, Hydraulic conductivity, boratory tests.
ntifiers: *Root cortex, Specific moisture pacity, Endodermis, Darcy-Richards equation, chappa sandy loam.

uations were developed which describe the nsient flow of water in a cylindrical soil-root tem. The main objective was to calculate water tential distributions in the root cortex as well as the surrounding soil. Numerical results in-ated that there will be small water potential dients in the soil relative to those in the root in upper 90% of the water availability range. Con-ry to past experiments, theory predicted that preciable amounts of water should flow from ots to soil when roots well supplied with water in contact with dry soil. An important implica-n of the study was that models designed to pre-t the pattern in which roots extract water from l will have to consider the rate-limiting aspect of root tissue. (Visocky-ISWS)
7-01147

TING OF IRRIGATED SOILS OF THE L'YAN REGION, (IN RUSSIAN),
E. Salaev, and R. A. Alieva.
Akad Nauk Az SSR Ser Biol Nauk 1, p 54-59. 5.

scriptors: *Soils, *Irrigated lands, Irrigation, gions, *Absorption, *Soil properties, sphorus, Nitrogen, Oxygen, Humus, *Soil ssification.
ntifiers: *Aal'yan region(USSR).

method of rating soils of irrigated regions SSR), a regional rating scale and appropriate rection factors for individual soil charac-istics were developed. The principal, most sta-intrinsic soil properties were used as the terion for rating the soil, the average values of mus, N, P and absorption capacity in the 0-20, 0 and 0-100-cm layers.--Copyright 1976, Biolog-l Abstracts, Inc.
7-01208

STEADY FLOW OF WATER THROUGH ILS DRAINED BY PARALLEL DITCHES, (IN ENCH),
essaloniki Univ., Salonika (Greece). Faculty of ronomy.
Tzimopoulos, and G. Terzidis.
J Hydrol (AMST) 27(1/2), p 73-93, 1975.

Descriptors: *Soils, *Unsteady flow, *Soil water movement, *Drainage, Equations model studies, Ditches, Europe.
Identifiers: *Boussinesq equation, *Greece.

The water movement through soils drained by parallel ditches is in general unsteady and can be described by the nonlinear Boussinesq equation. An analytical solution of this drainage equation subjected to general initial and boundary conditions has not yet been found because of its nonlinearity. Numberical methods should be used to obtain approximate solutions of the mixed boundary value problems of this equation. Numerical solutions are presented based on implicit computational schemes of the Crank-Nicolson, Laasonen and Douglas types. Experimental data, obtained by a Hele-Shaw model in the Hydraulics Laboratory of the School of Agriculture of the University of Thessaloniki (Greece), are in very good agreement with the values computed numerically by these implicit schemes.--Copyright 1976, Biological Abstracts, Inc.
W77-01219

WATER AND SALT DISTRIBUTION IN A SOIL UNDER TRICKLE IRRIGATION,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 3C.
W77-01271

LEAF WATER POTENTIAL AND STOMATAL ACTIVITY IN SORGHUM AS INFLUENCED BY SOIL MOISTURE STRESS,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 2I.
W77-01276

A NOTE ON THE USE OF BENTONITE CLAY AS A SUB-SOIL MOISTURE BARRIER FOR VEGETABLE PRODUCTION ON DRYLANDS OF RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W77-01277

SOIL MOISTURE USE BY VELVET MESQUITE (PROSOPIS JULIFLORA),
Arizona Univ., Tucson. School of Renewable Natural Resources.
R. C. Martin.
Master of Science Thesis, 1976. 9 fig, 1 tab, 12 ref, append.

Descriptors: *Soil moisture, *Soil water, *Soil-water-plant relationships, *Mesquite, *Water utilization, Soil water movement, Soil moisture meters, Moisture content, *Arizona, Desert plants, Range grasses, Watershed management, Vegetation, Water loss, Transpiration, Infiltration, Surface runoff.
Identifiers: Neutron thermalization, Prosopisis juliflora, Velvet mesquite.

A study was conducted to determine the amount of soil moisture used by the mature velvet mesquite trees on an upland site in southern Arizona. In addition, the moisture used by the trees at various distances from their trunks was quantified. Using the neutron thermalization method, soil moisture measurements were made adjacent to four live and four dead trees. Soil moisture levels at selected distances from the live and dead trees were compared and the differences graphically evaluated to determine seasonal soil moisture use. The results are presented. Despite problems encountered, the method offers a means of determining the quantity of moisture use by plants without significantly altering their immediate environment. (Jamail-Arizona)
W77-01283

THE EFFECT OF ENVIRONMENTAL FACTORS ON THE GROWTH OF A NATURAL PASTURE,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 2I.
W77-01285

INFLUENCE OF HYSTERESIS ON MOISTURE FLOW IN AN UNDISTURBED SOIL MONOLITH,
Goettingen Univ. (West Germany). Inst. of Soil Science and Forest Nutrition.
F. Beese, and R. R. van der Ploeg.
Soil Science Society of America Journal, Vol. 40, No. 4, p 480-484, July-August 1976. 8 fig, 17 ref.

Descriptors: *Soil moisture, *Hysteresis, *Drying, *Wetting, Soils, Podzols, Gray-brown podzolic soils, Physical properties, Lysimeters, Infiltration, Unsaturated flow, Soil properties, Soil water, Diffusion, Soil water movement, Mathematical models, Model studies, Laboratory tests, Sorption, Soil science.
Identifiers: *Soil suction.

The moisture dynamics of an undisturbed soil monolith were studied during a lysimeter experiment. Daily measurements were made of the soil suction at 10 depths. Also measured daily were the precipitation, the seepage, and the evaporation from the monolith during a 3-year period. For selected periods, a drying (desorption) curve and a wetting (sorption) curve of the soil moisture characteristic were determined from field data. Also, the capillary conductivity was determined with use of daily monolith observations. By using these hydraulic functions, the unsaturated soil moisture flow equation was solved numerically for one-dimensional vertical flow. In order to determine the effect of hysteresis on the suction distribution in the monolith, calculations were performed either with the desorption curve or with the sorption curve without scanning between the curves. Neither of the two curves led to complete agreement between observed and calculated soil suction values; the desorption curve usually gave too high values, and the sorption curve gave too low values. (Sims-ISWS)
W77-01323

RADIATION HAZARD FROM AMERICIUM-BERYLLIUM NEUTRON MOISTURE PROBES,
North Dakota State Univ., Fargo. Dept. of Soils.
G. W. Gee, J. F. Stiver, and H. R. Borchert.
Soil Science Society of America Journal, Vol. 40, No. 4, p 492-494, July-August 1976. 3 fig, 1 tab, 4 ref.

Descriptors: *Soil moisture meters, *Nuclear moisture meters, *Hazards, *Radiation, Soil moisture, Radioactivity, Safety, Instrumentation, Equipment, Monitoring, Measurement, Soil science.
Identifiers: *Radiation hazards, Fast neutrons, Radiation doses.

Neutron fluxes from shielded neutron moisture probes need to be measured to evaluate total radiation exposure from these instruments. Theoretical considerations suggest that for 100 mCi Am-Be neutron moisture probes the fast neutron flux can be relatively high and contribute significantly to the radiation exposure of probe operators. Measured radiation dose levels at the surface of 100 mCi Am-Be neutron probes manufactured by Troxler Laboratories were found to be as high as 37 m Rem/hour which exceeds reported levels by as much as 38 times. This was believed to be due to nonreporting of fast neutron fluxes. It was mentioned that conventional field use of these probes may present a radiation hazard to operators if the probe is hand carried for periods which exceed three hours per week. It was recommended that the probe be transported to and from sites inside a wooden storage crate and be kept at least 1 m from

personnel. Also, to improve the radiation safety factor for on site use, it was recommended that a hand cart be used to transport the probe. (Sims-ISWS)
W77-01324

MEASURING HYDROLOGIC PROPERTIES OF SOIL WITH A DOUBLE-RING INFILTROMETER AND MULTIPLE-DEPTH TENSIOMETERS,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
L. R. Ahuja, S. A. El-Swaify, and A. Rahman.
Soil Science Society of America Journal, Vol. 40, No. 4, p 494-499, July-August 1976. 10 fig, 1 tab, 5 ref.

Descriptors: *Hydrologic properties, *Soil water movement, *Soil physical properties, *Hawaii, Soil properties, *Infiltration, *Infiltrometers, *Tensiometers, On-site investigations, Forests, Forest watersheds, Soils, Loam, Clay loam, Percolation, Groundwater movement, Water spreading, Soil science, Instrumentation.
Identifiers: Soil-water characteristics.

A ring infiltrometer with varying width of buffer zone in combination with multiple-depth tensiometers was tested for determining the hydrologic properties of a Typic Dystrandept (Tantalus silty clay loam) soil profile on a forested watershed in Hawaii. With location of one multiple-depth tensiometer at the vertical axis of the axisymmetric flow system and one or more at a given radius outside the inner ring, the vertical and the radial hydraulic gradients could be simultaneously measured. It was thus possible to estimate the lateral flow components and to determine vertical infiltration rates and hydraulic conductivites (at field saturation) of the different soil horizons. Lateral flow decreased with time during infiltration. Under the moist-to-wet conditions of the soil under study, lateral flow was not appreciable. From an inner ring of 30-cm diameter, the lateral flow was practically eliminated when a buffer ring of 90-cm diameter was employed. The effect of lateral flow on the final infiltration rate was negligible even when a buffer ring of 60-cm diameter was used. (Sims-ISWS)
W77-01325

VISCOSITY OF INTERLAYER WATER IN MONTMORILLONITE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
P. F. Low.
Soil Science Society of America Journal, Vol. 40, No. 4, p 500-505, July-August 1976. 4 fig, 1 tab, 30 ref.

Descriptors: *Viscosity, *Permeability, *Clays, *Montmorillonite, *Viscous flow, Flow resistance, Diffusion, Hydraulic conductivity, Porous media, Soils, Soil properties, Physical properties, Analytical techniques, Groundwater movement, Soil water movement, Soil science.

The viscosities of water in Na-montmorillonite system at various water contents were calculated by different equations using data from experiments conducted by different investigators on: (1) viscous flow of water at different temperatures, (2) self-diffusion of water, and (3) neutron scattering by water. The results were remarkably consistent and showed that the viscosity of the interlayer water is greater than that of bulk water and increases exponentially with decreasing water content. Evidence was also presented to show that the viscosity of this water depends on the b-dimension of the associated montmorillonite. By combining the data on viscosity with data on hydraulic conductivity, it was possible to determine the permeability of the montmorillonite at different water contents. (Sims-ISWS)
W77-01326

HEAT AND WATER MOVEMENT UNDER SURFACE ROCKS IN A FIELD SOIL: I. THERMAL EFFECTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
W. A. Jury, and B. Bellantuoni.
Soil Science Society of America Journal, Vol. 40, No. 4, p 505-509, July-August 1976. 6 fig, 2 tab, 13 ref.

Descriptors: *Soils, *Rocks, *Heat flow, *Soil moisture, Soil water movement, On-site investigations, Model studies, Mathematical models, Thermal conductivity, Water vapor, Mulching, Droughts, Arid lands, Groundwater movement, Soil science.
Identifiers: Water vapor movement, Thermal effects.

Results of a field experiment designed to evaluate the effect of surface rocks on soil heat flow were presented. Temperature observations were made by thermocouples at 12 locations under and adjacent to rocks placed over bare soil. Continuous readings were taken for 24- and 48-hour intervals using seven different kinds of rock cover, ranging from large granite slabs to gravel piles, during the time between December 1974 and August 1975. Experimental results consistently showed a non-negligible 24-hour net horizontal heat flow toward the rock at both the 2.5 and 5.0 cm depth. Net vertical heat flow was always downward in the soil under the bare surface but was observed to be either upward or downward in the soil under the rock cover depending on prior conditions. Because water vapor movement in moist soil is generally in the same direction as heat flow, it was suggested that surface rock cover may be a mechanism for water collection in arid climates. A simulation model was constructed to describe two-dimensional heat flow in a uniform soil with a rectangular rock on the surface. Using the measured surface temperature as boundary values and a soil thermal conductivity corresponding to the mean daily soil surface temperature, the simulation model adequately reproduced the observed temperatures under and adjacent to the rock. (See also W77-01328) (Sims-ISWS)
W77-01327

HEAT AND WATER MOVEMENT UNDER SURFACE ROCKS IN A FIELD SOIL: II. MOISTURE EFFECTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
W. A. Jury, and B. Bellantouni.
Soil Science Society of America Journal, Vol. 40, No. 4, p 509-513, July-August 1976. 5 fig, 3 tab, 7 ref.

Descriptors: *Soils, *Rocks, *Heat flow, *Soil moisture, Soil water movement, On-site investigations, Laboratory tests, Model studies, Mathematical models, Computer models, Thermal conductivity, Water vapor, Mulching, Droughts, Arid lands, Groundwater movement, Soil science.
Identifiers: Water vapor movement, Moisture effects.

Results were presented from a field experiment conducted to determine the effect of surface rocks on soil water content change under bare soil. First, stones were placed at intervals over an initially dry field (gravimetric water content = 0.021 g/g) and left for 6 weeks. Subsequent sampling showed a small, but detectable, excess of water stored under the rock compared to adjacent bare soil. Following an irrigation, buried thermal conductivity probes were used to monitor water content changes under and adjacent to surface rocks. After 24 days, the soil under the rock contained significantly more water than did the soil region adjacent to the rock, a finding confirmed by gravimetric sampling. Following this, the stones and probes were relocated for a further 24 days of observation, with similar results obtained. In a separate laboratory experiment using a large, sealed soil column with a rock covering part of the surface, it was demonstr that a significant amount of water moved to cylinder of soil under the rock from the soil re under the bare surface due to horizontal temp ture gradients induced by the rock covering pa the surface. A two-dimensional computer prog calculating water vapor movement under the gradients was used with measured field temp ture boundary conditions to estimate the am of water vapor movement expected to occur to a rock cover on the soil surface. Results qua tively confirmed the observations of the se laboratory column experiment. (See also W 01327) (Sims-ISWS)
W77-01328

ENVIRONMENT POLLUTION BY GANOPHOSPHORUS COMPOUNDS, (IN SIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institu gieni I Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5B.
W77-01352

SOME SOIL HYDRAULIC CONSIDERATI IN LIQUID WASTE DISPOSAL,
Department of Agricultural Technical Serv Pretoria (South Africa).
For primary bibliographic entry see Field 5E.
W77-01354

A RECORDING SOIL MOISTURE TENSIO TER,
Forest Service (USDA), Portland, Oreg. Pa Northwest Forest and Range Experiment Stat
W. J. Walkotten.
Research Note PNW-180, June 1972, 12 p, 6 f ref.

Descriptors: *Tensiometers, *Soil moisture, management, *Instrumentation, Measurement

A recording water-saturated porous cup tensi ter that operates in the negative pressure ran a mercury manometer-type tensiometer provi continuous record of soil moisture tension periods up to 31 days. This instrument detect moisture changes and diurnal fluctuations; i also shown rapid response to increasing moisture during rainfall. Parts and materia construction cost less than $150. (Forest Servi
W77-01429

MULCH AND MICROCLIMATE: THE NIFICANCE OF MULCH AND THE CHA IN TEMPERATURE BEHAVIOR RESULT FROM IT, (IN DUTCH),
Agricultural Univ., Wageningen (Netherla Lab. of Physics and Meteorology.
E. A. R. Mellaart.
Meded Landbouwhogesch Wageningen. 75(5) 30, 1975.

Descriptors: Equations, *Mulching, microbiology, *Soil treatment, *Soil inves tions, *Soil structure, Evaporation control, moisture, Soil properties, Cultivation, Plant eases, Toxins.
Identifiers: Plant pests.

An equation is developed comparing a homog ous and a mulched soil receiving the same am of radiation. The possible influence on eva tion is also discussed. Most mulches affect biological activities of the soil, usually du changes in temperature, moisture content often pH, soil structure, etc. In recent re comparing tilled with untilled mulched fields soil structure and biological activity of the un fields was as good, if not better than tho mulched fields that were tilled. On the other h plant diseases and pests may be encourage mulching. Damage may also be done by the ex tion of toxic substances from the mulch.–C right 1975, Biological Abstracts, Inc.

77-01447

OIL-WATER-PLANT RELATIONSHIPS - IMRTANT DESIGN CRITERIA FOR IRRIGAON-PLANNING, (GROND-PLANT-WATERRHOUDINGS AS BELANGRIKE ONTWERPGEWENS VIR BESPROEIING-EPLANNING),
ellenbosch Univ. (South Africa). Dept. of riculture.
r primary bibliographic entry see Field 3C.
77-01454

MELIORATION OF SUBSURFACE ACIDITY LEACHING OF SURFACE APPLIED MENDMENTS. A LABORATORY STUDY,
uit and Fruit Technology, Research Inst., Stelbosch (South Africa).
A. G. Kotze, and J. Deist.
rochemophysica 7, p 39-45, (1975). 4 fig, 4 tab, ref.

scriptors: *Leaching, Ion exchange, *Acidic ls, *Clay minerals, Calcium, Calcium hydrox-, *Calcium compounds, Gypsum, Nitrates, oil treatment.
entifiers: South Africa, Calcium nitrate.

:Al exchange equilibria in acid soils and clay nerals indicated that Al is strongly preferred to on the exchange complex, but that Al concention in the equilibrium solution is low when Al turation of the exchange complex is less than 60 80%. Leaching of soil columns after application Ca(OH)2, Ca-nitrate and gypsum indicated that effect of Ca(OH)2 was limited to the site of apcation, whereas Ca-nitrate and gypsum inased exchangeable Ca and decreased Al roughout the column. The decrease in exchangele Al was ascribed to an anion induced lymerization of Al as well as exchange and ching of Al by Ca. (South Africa)
77-01483

ECIFIC ADSORPTION OF TRACE MOUNTS OF CALCIUM AND STRONTIUM HYDROUS OXIDES OF IRON AND ALUINUM,
assey Univ., Palmerston North (New Zealand). pt. of Soil Science.
G. Kinniburgh, J. K. Syers, and M. L. Jackson.
il Science Society of America Proceedings, Vol. No. 3, p 464-470, May-June 1975. 5 fig, 1 tab, ref.

scriptors: *Iron, *Aluminum, *Adsorption, emical analysis, Chemical reactions, *Oxides, alcium, *Strontium, Gels, Sodium compounds, ace elements.
entifiers: *Hydrous oxides, *Sodium nitrate.

eshly prepared Fe and Al hydrous oxide gels d the amorphous product of heating gibbsite ectively adsorbed traces of Ca and Sr from lutions containing a large excess of NaNO3. The ction of the added Ca (Sr) adsorbed depended ncipally on the suspension pH, the amount of id present, and to a lesser extent on the NaNO3 ncentration. (Skogerboe-Colo St)
77-01513

MMONIA VOLATILIZATION FROM SURCE APPLICATIONS OF AMMONIUM COMUNDS ON CALCAREOUS SOILS: IV. EFCT OF CALCIUM CARBONATE CONTENT,
xas A and M Univ., El Paso. Agricultureal search Station.
B. Fenn, and D. E. Kissel.
il Science Society of America Proceedings, Vol. No. 4, p 631-633, July-August 1975. 2 fig, 2 tab,

scriptors: *Ammonia, *Calcium carbonate, itrogen, *Fertilizers, *Fertilization, Soil, Water llution sources, *Soil chemistry, Soil analysis.
Identifiers: *Ammonia volatilization, *Ammonia-nitrate.

The purpose of this study was to determine the effect of soil CaCO3 content on ammonia volatilization from surface applied ammonium compounds. Ammonia-nitrogen losses from surface-applied (NH4)2SO4 increased rapidly to 6.1% soil CaCO3, with slight NH3 loss increases from 6.1 to 9.7% soil CaCO3, and no NH3 loss increase beyond 9.7% soil CaCO3. Ammonium nitrate reached maximum NH3-N loss at 1.3% soil CaCO3 and 110 kg NH4+-N/ha, with lower but still increasing losses of NH3-N at 6.1% soil CaCO3 and 550 kg NH4+-N/ha. (Skogerboe-Colo St)
W77-01515

CONVENTIONAL AND CONTROLLED-RELEASE NITROGEN SOURCES FOR RICE,
Arkansas Agricultural Experiment Station, Stuttgart. Rice Branch Experiment Station.
For primary bibliographic entry see Field 3F.
W77-01516

INTERACTIONS OF BEEF CATTLE WASTES WITH SOIL,
For primary bibliographic entry see Field 5B.
W77-01539

2H. Lakes

FUTURE CHEMICAL COMPOSITION OF THE GREAT SALT LAKE BRINES,
Brigham Young Univ., Provo, Utah.
J. M. Glassett, and P. J. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 505, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, August 1976. 168 p, 2 tab, 19 fig, 47 ref, 8 append. OWRT B-126-UTAH(1). 14-34-0001-6124.

Descriptors: *Brines, *Salinity, *Mathematical models, *Specific gravity, Saline lakes, Saltation, Diffusion, Mixing, Planning, Hydrology, *Great Salt Lake, *Utah, Bridges, Forecasting, Salt balance, Lakes, Water balance, Culverts, Chemistry.
Identifiers: Railroad causeway, Culvert flows, Causeway flows.

A fifteen mile long rock and gravel railroad causeway was completed across Great Salt Lake in 1959 dividing the lake into north and south arms. This causeway has resulted in drastic hydrological changes within the lake. Past predictions of the future salinity of the Great Salt Lake brines have been largely empirical extrapolations. This study developed a theoretical mathematical model to more accurately predict the specific gravity of the upper south arm brine for any year or lake elevation. The basic parameters which were modeled include: (1) the overall salt and water balances, (2) the diffusion and mixing of salts from the dense lower layer of the south arm of the lake into the more dilute upper layer, (3) the two directional flows of brine through the culverts which breach the causeway, and (4) the two directional flows through the permeable causeway fill. Results show that the specific gravity of the upper south arm brine is reaching a steady state situation in which its salinity will remain constant with time.
W77-01053

SHORELAND REGULATION IN WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6E.
W77-01087

A CLIMATONOMIC STUDY OF THE LAKE ONTARIO DRAINAGE BASIN,
California Univ., Berkeley, Dept. of Geography.
O. Granger.
Water Resources Research, Vol. 12, No. 4, p 751-761, August 1976. 6 fig, 6 tab, 30 ref.

Descriptors: *Runoff, Lake Ontario, *Streamflow, *Model studies, *Evapotranspiration, Drainage area, Seasonal, Equations, Moisture, Energy, Evaporation, Watersheds(Basins), *Climatology.
Identifiers: *Lake Ontario basin, *Climatonomic study, Monthly runoff, Moisture level, Stored moisture change, Moisture regimes.

An evapotranspiration climatology model was applied to the Lake Ontario drainage basin and to subbasins within it. The model was based on the model of Lettau and Baradas (1973) and was designed to compute monthly runoff, actual evapotranspiration, exchangeable moisture level and stored moisture change, and incorporated seasonally varying parameter values. The model was refined and improved by using a 'direct search' optimization technique (Rosenbrock, 1960) to obtain monthly values of the set of prescribed parameters, which were calibrated using data for 1969-1971 inclusive and for long-term means. The parameters were then applied to relevant 1972 data as an independent test of the validity of the model. The results were consistent and reasonably reliable by comparison with others. The parameter values were physically justifiable and in accord with comparable parameter values reported in the literature. Computed monthly runoffs were within 1.4% of observed streamflow in the unregulated subbasins and within 6.0% in a subbasin that was regulated. For the Lake Ontario basin as a whole, computed monthly runoff was within 7.0% of measured outflow adjusted for lake level changes. The agreement was within 3.5% in the case of annual values. Computed monthly actual evapotranspiration was in excellent agreement with other studies. It was concluded that the model, with a calibrated set of seasonally varying parameter values, was a viable approach for the study of the moisture regimes of catchments. (Roberts-ISWS)
W77-01146

PRELIMINARY ESTIMATION OF COLD WATER AVAILABILITY IN LAKES FOR FISH HATCHERIES,
MacLaren (James F.) Ltd., Willowdale (Ontario). Hydrotechnical Div.
G. Balachandran, P. E. Wisner, and H. S. Belore.
Water Resources Bulletin, Vol. 12, No. 5, p 1041-1048, October 1976. 2 fig, 11 ref.

Descriptors: *Fish hatcheries, *Lakes, *Stratification, *Temperature, *Cold-water fish, *Water availability, *Estimating, Management, Water quality, Freshwater, Simulation analysis, Equations, Mathematical models, Systems analysis, Forecasting.
Identifiers: *Thermal models, Water withdrawal rate.

Fish hatcheries for cold water species (e.g., salmonids) require water below a certain specified optimum temperature. Deep lakes and reservoirs, which are thermally stratified, will have cold water below the thermocline suitable for fish hatchery supplies. Proper management will require withdrawal of water at different depths and a mixture of correct proportions can yield water at desired temperatures and quality. For preliminary studies, a mathematical model can be used to show by a comparatively simple computation the effect of different withdrawal rates of cold water and to check if the situation is critical. A critical situation may warrant the application of sophisticated computer models and/or the use of chilling at the hatchery. The method is illustrated by a case study for a small lake in the Province of Nova Scotia. (Bell-Cornell)
W77-01168

IFYGL RAWINSONDE DATA ACQUISITION SYSTEM,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
C. J. Callahan, J. A. W. McCulloch, E. J. Aubert, and E. M. Rasmusson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 968, Price codes: A03 in paper copy, A01 in microfiche.
IFYGL Technical Manual Series No. 6, January 1976. 42 p, 13 fig, 14 tab, 13 ref.

Descriptors: *Remote sensing, *Meteorological data, *Great Lakes, *Atmosphere, Winds, Pressure, Atmospheric pressure, Temperature, Air temperature, Humidity, Sites, Operation and maintenance, Equipment, Data processing, Weather data, Meteorology, International Hydrological Decade.
Identifiers: *International Field Year for the Great Lakes, *Rawinsondes.

Early in the planning stages of IFYGL, in 1967, substantial interest developed in the general topic of lake meteorology and evaporation. The Boundary Layer, the Terrestrial Water Balance, and the Energy Balance Panels were involved in calculations whose accuracy could be improved by a denser network of upper air stations than was normally operated by the United States and Canadian governments. A study of previous network augmentations and the results of three feasibility studies conducted by the Canadian Atmospheric Environment Service were integrated. This evaluation indicated a reasonable probability of obtaining useful weekly-to-monthly estimates of lake evaporation with a network of six to eight LORAN-C rawinsonde stations around the lake, and a high probability of obtaining a unique set of high-quality, high-resolution data from these same stations for use in other studies. The decision was made, therefore, to conduct an IFYGL rawinsonde program. This report on the IFYGL Rawinsonde Data Acquisition System had two major objectives: (1) to provide data users with descriptions of the equipment, techniques, and procedures used in collecting the data, and of data characteristics, and (2) to provide investigators planning similar programs in the future with operational details on capability, performance, and cost factors as an aid in planning, logistics, and decision making. (Sims-ISWS)
W77-01189

EFFECTS OF THE COOLING WATER DISCHARGE ON THE MACROINVERTEBRATES AND FISH POPULATIONS AROUND FLEVO POWER STATION,
For primary bibliographic entry see Field 5C.
W77-01245

LOWER GREEN BAY. AN EVALUATION OF EXISTING AND HISTORICAL CONDITIONS,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5C.
W77-01287

THE NUTRITION OF GREAT LAKES CLADOPHORA,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5C.
W77-01288

GUIDELINES FOR LAKE WATERSHED MANAGEMENT PLANNING.
Maine Dept. of Environmental Protection, Augusta. Bureau of Water Quality Control.
For primary bibliographic entry see Field 5G.
W77-01291

COFFEE POND WATERSHED MANAGEMENT PLAN.
Maine Dept. of Environmental Protection, Augusta. Bureau of Water Quality Control.
For primary bibliographic entry see Field 5G.
W77-01292

FOREST LAKE WATERSHED MANAGEMENT PLAN.
Maine Dept. of Environmental Protection, Augusta. Bureau of Water Quality.
For primary bibliographic entry see Field 5G.
W77-01293

RESOURCE INVENTORY MANAGEMENT PLANNING SYSTEM (RIMPS). USER MANUAL,
Jordan (Edward C.), Inc., Portland, Maine.
For primary bibliographic entry see Field 5G.
W77-01294

THE ORIGIN OF SOUTHERN AFRICAN COASTAL LAKES,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies; and Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology.
B. J. Hill.
Trans. roy. Soc. S. Afr., Vol. 41, Part 3, p 225-240, (1975). 9 fig, 18 ref.

Descriptors: *Lake morphometry, Bathymetry, *Lake stages, *Africa, *Lakes.
Identifiers: South Africa, Natal, Zululand, Mocambique, *Coastal lakes(Africa).

There are two groups of southern African lakes, a southern group made up of the Wilderness lakes and a north-eastern group comprising lake on the Natal, Zululand and southern Mocambique coastal plain. Bathymetric maps are presented for representative lakes of these two series. There appear to be three types of lakes with respect to origin. Most of the lakes represent drowned valleys associated with river systems. Evidence is presented to show that St Lucia, although 1 to 2 m deep at present, was originally much deeper. The narrow coastal lakes of southern Mocambique are interpreted as low-lying land inundated as a result of rise in sea-level. The third type of lake is typified by Rondevlei at Wilderness, this lake apparently originated as a deflation basin. (South Africa)
W77-01356

A PRELIMINARY TROPHIC STATUS CLASSIFICATION OF SOME SOUTH AFRICAN IMPOUNDMENTS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5C.
W77-01363

SURVEY OF MGOBEZELENI LAKE-SYSTEM IN ZULULAND, WITH A NOTE ON THE EFFECT OF A BRIDGE ON THE MANGROVE SWAMP,
Institute for Freshwater Studies, Ubombo (South Africa). Lake Sibaya Research Station.
M. N. Bruton, and C. C. Appleton.
Trans. Roy. Soc. S. Afr., Vol 41 (3), p 283-294, (1975). 4 fig, 2 tab. 17 ref.

Descriptors: *Lakes, Mollusks, Crustaceans, Fish populations, Bridges, Mangrove swamps, *Biota, Water level, Salinity, Limnology, Environmental impact, Africa.
Identifiers: South Africa, *Mgobezeleni lake, *Zululand, Natal, Decapoda.

The Mgobezeleni lake-system in Zululand is described and a checklist of decapod crustacea, molluscs and fish presented. The biota consists of freshwater, estuarine and marine forms. Several uncommon or rare species were found. The eff of various man-made changes on the system is sessed, with particular reference to the mangro community. Constantly high water levels and cess fresh water have decimated the Bruguie gymnorhiza forest and associated fauna resp tively. (South Africa)
W77-01380

THE LIMNOLOGY OF LAGOA POELELA,
Rhodes Univ., Grahamstown (South Africa). In of Freshwater Studies: and Rhodes Uni Grahamstown (South Africa). Dept. of Zoolo and Entomology.
B. J. Hill, S. J. M. Blaber, and R. E. Boltt.
Trans. Roy. Soc. S. Afr., Vol 41 (3), p 263-2 (1975). 2 fig, 3 tab, 15 ref.

Descriptors: *Limnology, Salinity, Water te perature, Dissolved oxygen, Light penetrati Lakes, Aquatic weeds, Sodium, Fish populatio Brackish water, Physicochemical properti Africa, Tilapia.
Identifiers: *Lagoa Poelela, *Mozambiq Southern Africa, Potamogeton pectinatus, Nai Chara.

The limnology of Lagoa Poelela in southe Mozambique was investigated in July 1973. T lake is connected to the sea via a 75 km long ch nel, the area is 65 km2, it has a mean depth 13,7m and a maximum depth of 24 m. The wa was saline (8 degree/00) and the major ions, w the exception of sodium, were in the proportio expected of diluted sea water. The concentrati of sodium was twice as high as expected; this so um enrichment has been found in other coas lakes. Temperatures were relatively uniform fr the surface to the bottom and the oxygen satu tion at 20 m was 80% of the surface value. Li penetration was higher than for other southe African lakes and at 22 m was 3% of surface il mination. Aquatic macrophytes were absent fr shallow water in the main lake, only being fou deeper than 3 metres where Potamogeton p tinatus and Naias marina were common. Na was found to a depth of 10 m and Chara sp. to m. Only 11 species of fish were found. The fi population was dominated by the cichlids Tila rendalli and T. mossambica although so estuarine species were also found. It is suggest that the domination of this brackish lake cichlids reflects a general tendency for cichlids increase in numbers in estuarine systems wh become isolated from the sea. (South Africa)
W77-01381

THE EUTROPHICATION LEVELS OF SOM SOUTH AFRICAN IMPOUNDMENTS. 1. RIE VLEI DAM,
National Inst. for Water Research, Pretoria (Sou Africa).
For primary bibliographic entry see Field 5C.
W77-01391

EUTROPHICATION LEVELS OF SOME SOUT AFRICAN IMPOUNDMENTS. II. HAR BEESPOORT DAM,
National Inst. for Water Research, Pretoria (Sou Africa).
For primary bibliographic entry see Field 5C.
W77-01392

LIMNOLOGICAL DATA REPORT FOR TH MAINE DEPARTMENT OF ENVIRONMENTA PROTECTION--U. S. GEOLOGICAL SURVE COOPERATIVE LAKE STUDIES PROJECT,
Geological Survey, Augusta, Maine.
D. J. Cowing, and M. Scott.
Open-file report, June 1976. 168 p, 1 fig, 3 tab, ref.

Descriptors: *Maine, *Lakes, *Water chemistr *Lake morphology, *Limnology, Water analysi

emical analysis, Biological properties, ytoplankton, Zooplankton, Benthos, Water nperature, Thermal stratification.

ysical, chemial, and biological data collected ring the 1975 calendar year are presented for 43 ine lakes. Methods for the collection and analy- of the hydrologic data are outlined. Physical aracteristics include drainage area, surface area, face elevation, volume, maximum depth, mean pth, epilimnion depth, epilimnion volume, and gth of shoreline. Water-quality analyses are ed for up to 27 parameters on the lake-sample es and 5 parameters on flowing tributaries. ological analyses include phytoplankton data for lakes, zooplankton data for 4 lakes, benthic croinvertebrate data for 25 lakes, and bacterial ta for lake tributaries. (Woodard-USGS)
77-01414

NOTATED BIBLIOGRAPHY OF THE KES, PONDS, AND RESERVOIRS OF NEW RK STATE THROUGH 1974 (EXCLUSIVE LAKES ERIE AND ONTARIO),
ological Survey, Albany, N.Y.
E. Greeson, G. K. Schultz, and P. A. Vopelak.
ailable from the National Technical Informa- n Service, Springfield, VA 22161 as PB-256-408, ce codes: A16 in paper copy, A01 in microfiche. ological Survey Water-Resources Investiga- ns 76-55, July 1976. 360 p.

scriptors: *Bibliographies, *Abstracts, ublications, *Limnology, *New York, Lakes, nds, Reservoirs, Documentation, Information rieval.

re than 1,200 titles and abstracts of limnologi- studies of ponds, reservoirs, and lakes in New rk (excluding Lakes Erie and Ontario) are com- ed in one volume. Publications cited date from late 19th century through 1974. Titles and ab- acts are presented alphabetically by author's me; cross indexes of coauthors, locations, and bjects are also provided. Author's abstracts re used if available; the remainder were written the compilers of this volume and are so signated. Some of the publications cited could t be obtained for review; they are given mplete reference but have no accompanying ab- act. This compilation is an exhaustive index to nnological studies within the State. It is intended use mainly by those concerned with water-use nning, water management, and lake ecology. oodard-USGS)
77-01418

IE BENTHOS OF SOME SOUTHERN RICAN LAKES PART 3: THE BENTHIC UNA OF LAKE NHLANGE, KWAZULU, UTH AFRICA,
odes Univ., Grahamstown (South Africa). pt. of Zoology and Entomology; and Rhodes iv., Grahamstown (South Africa). Inst. of eshwater Studies.
E. Boltt, and B. R. Allanson.
ans. roy. Soc. S. Afr., Vol 41 (3), p 241-262, 75). 13 fig, 9 tab, 27 ref.

scriptors: *Benthos, *Benthic fauna, *Salinity, at, Detritus, Decomposing organic matter, ods, *Dissolved oxygen, Seasonal, Oxygen, d-water interfaces, Standing stock, Dominant ganisms, Water level fluctuations, Substrates, uatic insects, Lakes, Physicochemical proper- s, Water depth, Crustacea, Annelids, Coelen- ata, Nematoda, Mollusks, Oxygen demand, rica.
ntifiers: *Lake Nhlange, *South Africa, Ox- en depletion.

ke Nhlange (KwaZulu, South Africa) is con- cted to the sea through the Kosi estuary and has alinity between 36 degrees/oo and 5 degrees/oo. e benthos of the lake was sampled at approxi- tely six-monthly intervals from July 1965 to January 1969. The substrates are mainly sandy in shallow water and also on steeply sloping profiles even in the deepest water of 30 m. Flat areas are mainly silty. In December 1965, following the closure of the estuary mouth and severe rains, the lake level rose to about 2 m above its normal level. Although the salinity changed little (5 degrees/oo to 3 degrees/oo), quantities of peat-stained water and detritus were brought into the lake. A waning pattern of low oxygen conditions below about 12 m in the hot season, followed by reasonably well-oxygenated conditions in the cold season, was found. Particularly severe oxygen depletions were discovered at the mud water interface, even where well-oxygenated conditions pertained in the open water column at equivalent depths. Evidence that the fauna was driven into shallower waters by the influx of detritus, with its high oxygen demand, is given and a slow recolonization of the deeper water is shown. (See also W77-01438 and W77-01439) (South Africa)
W77-01437

THE BENTHOS OF SOME SOUTHERN AFRICAN LAKES PART 4: THE BENTHOS OF LAGOA POELELA,
Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology; and Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
R. E. Boltt.
Trans. Roy. Soc. S. Afr., Vol 41(3), p 273-281, (1975). 4 tab, 8 ref.

Descriptors: *Benthos, *Vertical distribution, *Benthic fauna, Dominant organisms, Zooplankton, Lakes, Standing stock, Biomass, Submerged plants, Species abundance, Africa.
Identifiers: Pontogeloides latipes, *South Africa, *Mozambique, *Lagoa Poelela, Musculus virgilius, Chara, Grandidierella bonnieri.

The benthos of Lagoa Poelela (Mozambique) was sampled in July 1973 with a Van Veen grab. The substrates of the lake were sandy between 0 m and about 3 m. Thereafter sand and silt were common to about 9 m and mainly pure silt below this depth. The benthos was mainly distributed between 0 and about 12 m, with very little below that depth. The faunal list comprises 19 taxa of which only nine can be classed as truly dominant benthic organisms, the remainder being only either planktonic forms with brief sojourns in the benthos or uncommon. Three forms dominate the standing stock biomass. Musculus virgilius associated with Chara between 5 and 2 m has a biomass of 2,307 g m-2. Grandidierella bonnieri has a biomass of 0,213 g m-2 between 0 and 3 m and 0,143 between 5 and 12 m. Pontogeloides latipes is most abundant in 0-3 m with a standing stock of 0.172 g m-2. It is argued that this lake may develop either a thermocline or a halocline or both during summer, and hence the very low biomass of 0,007 g m-2, below 12 m. (See also W77-01437 and W77-01439) (South Africa)
W77-01438

THE BENTHOS OF SOME SOUTHERN AFRICAN LAKES PART 5: THE RECOVERY OF THE BENTHIC FAUNA OF ST LUCIA LAKE FOLLOWING A PERIOD OF EXCESSIVELY HIGH SALINITY,
Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology; and Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
R. E. Boltt.
Trans. Roy. Soc. S. Afr., Vol 41 (3), p 295-323, (1975). 6 fig, 11 tab, 11 ref, append.

Descriptors: *Benthos, *Benthic fauna, *Salinity, Aquatic insects, *Salt tolerance, Ostracoda, Zooplankton, Gravimetric analysis, Numerical analysis, Standing stock, Dominant organisms, Food abundance, Diptera, Africa.
Identifiers: *St Lucia Lake, *Zululand, Natal, *South Africa, Assiminea bifasciata, Polypedilum.

St. Lucia Lakes (Zululand, South Africa) were sampled with a Van Veen grab in January 1972, July 1972, and January 1973. The system had high salinities at the commencement of the programme (70 degrees/oo-80 degrees/oo False Bay, 55 degrees/oo-60 degrees/oo North Lake, 45 degrees/oo-58 degrees/oo South Lake) which quickly dropped to less than sea-water values in the first six months. The January 1972 samples showed that only a few Polypedilum (Chironomidae) survived in False Bay, while a very reduced faunal list was shown for North Lake (9 sp.). Nevertheless South Lake showed a fairly complete faunal list (21 sp.). By July 1972 nine species were recovered in False Bay, 18 in North Lake and 23 in South Lake, indicating reinvasion consequent upon dilution of the salts in the water. No great change was shown by the result of the January 1973 samples. Evidence suggests that most forms would tolerate salinities up to about 55 degrees/oo salinity. Beyond this level only Chironomid larvae and Ostracods survived. Most rapid reinvasion of the denuded parts of the system was by rapidly maturing forms with planktonic larvae. There is evidence of exchanges of water between the various areas consequent upon wind induced seiches which would carry the planktonic larvae to these denuded areas. (See also W77-01437 and W77-01438) (South Africa)
W77-01439

METAL ENRICHMENT OF SEDIMENTS IN INLAND WATERS - THE HARTBEESPOORT DAM,
Pretoria Univ. (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-01487

THE LIMNOLOGICAL INVESTIGATIONS OF REICOTOPS AND PHENOMENON OF CURRENT TRAVERTINISATION IN PLITVICKA JEZERA (PLITVICE LAKES, YUGOSLAVIA), (IN SERBO-CROATIAN),
I. Matonickin, Z. Pavletic, V. Tavcar, and N. Krkac.
Prirodosl Istraz Acta Biol. 40, p 5-68, 1971.

Descriptors: *Inflow, *Karst, *Karst hydrology, *Water types, Biological communities, Running waters, Alkalinity, Hardness(Water), *Travertine, Limestones, *Mosses, Lakes.
Identifiers: Cinclidotus aquaticus, Cratoneurum commutatum, Didymodon tophaceus, Platyhpnidium rusciforme, *Reicotops, *Yugoslavia(Plitvice Lakes).

Exceptional hydrological conditions such as a large influx of water and karstic terrain have produced unique ecological conditions in the running water biotopes of this area. The waters have high alkalinity and bicarbonate hardness. The complex of living communities in the Plitvice Lakes is very distinct and depends on ecological factors and the degree of development of travertine forms. These communities are briefly described and their flora and fauna discussed. Mosses such as Cinclidotus aquaticus, Platyhypnidium rusciforme, Cratoneurum commutatum and Didymodon tophaceus may, depending on the temperature, actively build travertine layers.—Copyright 1975, Biological Abstracts, Inc.
W77-01540

LARVAL CONTRACAECUM (NEMATODA, ANISKIDAE) IN THE PERICARDIUM OF FISHES FROM EAST AFRICAN LAKES,
Hebrew Univ., Jerusalem (Israel). Heinz Steinitz Marine Biology Lab.
For primary bibliographic entry see Field 5C.
W77-01545

BIOLOGY OF JUVENILE BREAM IN THE MINGECHAUR RESERVOIR, (IN RUSSIAN),
L. V. Strazhnikova.

Izv Akad Nauk Az SSR Ser Biol Nauk. 4, p 89-91, 1974.

Descriptors: Rivers, Reservoirs, *Fish, *Growth rates, *Juveniles, *Fish biology.
Identifiers: Azerbaijan-SSR, *Bream, *Mingechaur, Reservoir(USSR).

The growth rate of juvenile bream in the Mingechaur Reservoir on the Kura River in the Azerbaijan SSR (USSR) has accelerated slightly in the 1st years since the reservoir opened in 1953. In comparison with other bodies of water the growth rate of juveniles is slightly lower and there is a lag in the ponderal index. The ponderal index of the juveniles changes little during the year, apparently because of abundant food.--Copyright 1975, Biological Abstracts, Inc.
W77-01546

2I. Water In Plants

WATER SUPPLY CATCHMENT HYDROLOGY RESEARCH: THE WALLABY CREEK FOG DRIP STUDY,
Melbourne and Metropolitan Board of Works (Australia). Hydrological studies Section.
M. J. O'Connell, and P. J. O'Shaughnessy.
Melbourne and Metropolitan Board of Works Reports No. MMBW-W-004, May 1975. 38 p. 8 fig., 8 tables, 7 ref., 3 append.

Descriptors: *Fog, *Forest watersheds, *Interception, *Australia, Vegetation effects, Water yield, Age, Forests, Water supply, Precipitation(Atmospheric).
Identifiers: *Eucalyptus-regnans, *Wallaby Creek(Vic), *Fog drip.

A study is reported which aimed to measure fog drip and assess its importance as a source of precipitation under mountain ash forest (Eucalyptus regnans), and to determine the effect of forest age on the magnitude of fog drip. Two plots, each 40 metre square were set up under different aged stands of mountain ash, and equipped with recording rain gauges, which were relocated at random every week. A further recording rain gauge was placed at a fixed location in a clearing. Fog drip was determined by comparing the precipitation records under the forest with that in the open. Over a four-year period, it was concluded that fog drip under the forest was less than one percent of gross precipitation in the open, and that there was no significant effect of forest age on fog drip. (CSIRO)
W77-01070

WATER TRANSPORT IN THE SOIL-ROOT SYSTEM: TRANSIENT ANALYSIS,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W77-01147

GROWTH OF THE YELLOWCHEEK ELOPICHTHYS BAMBUSA (RICH.) IN THE AMUR BASIN, (IN RUSSIAN),
Tikhookeanskiĭ Nauchno-Issledovatelskiĭ Institut Rybnogo Khozyaistva i Okeanografiĭ, Khabarovsk (USSR). Lab. of Freshwater Fish.
M. L. Krychtin.
Vopr Ikhtiol. 15(1), p 101-108, 1975.

Descriptors: *Fish, Carnivores, *Growth rates.
Identifiers: *Amur Basin(USSR), Elopichthys-Bambusa, USSR, *Yellow-Cheek, Pelagic fish.

The yellow-cheek E. bambusa is a large carnivorous pelagic fish having high meat qualities. In the Amur basin (USSR) it has a comparatively high rate of growth and weight gain. The females grow more rapidly than the males and the difference in growth between them increases steadily with age. The yellow-cheek population in the Amur basin at an age of 10-12 yr reaches an average length of 100-110 cm and weight of 10-14 kg.--Copyright 1975, Biological Abstracts, Inc.
W77-01229

SOIL NITRATE LOSS DURING IRRIGATION: ENHANCEMENT BY PLANT ROOTS,
California Univ., Berkeley, Coll. of Natural Resources.
For primary bibliographic entry see Field 3F.
W77-01268

LEAF WATER POTENTIAL AND STOMATAL ACTIVITY IN SORGHUM AS INFLUENCED BY SOIL MOISTURE STRESS,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
A. Blum, and C. Y. Sullivan.
Israel Journal of Botany, Vol 23, p 14-19, 1974. 4 fig, 15 ref.

Descriptors: *Sorghum, *Moisture stress, *Soil-water-plant relationships, *Soil moisture, *Leaves, Stomata, Crops, Drying, Transpiration, Droughts, Cereal crops, Wetting, Growth chambers, Diffusion.

Five sorghum varieties were grown in soil in a growth chamber and submitted to two consecutive soil drying cycles separated by a three day recovery period. During each drying cycle measurements were made on stomatal pore width, leaf diffusion resistance, leaf water potential and soil water potential. The water relations of sorghum plants differed greatly between the two drying cycles. A major effect of the first drying cycle on plant response to stress during the second drying cycle was a markedly reduced response of stomotal aperture to change in leaf water stress, thus confirming previous research findings. A second effect concerned relations between soil water potential and leaf water potential. As soil water potential decreased, plants in the second cycle maintained a higher (less negative) leaf water potential than in the first drying cycle. A previous drought may reduce the soil-to-leaf water potential gradient developed along the recovered plant, and thus imply increased adaptation to soil moisture stress, or a hardening effect. (Jamail-Arizona)
W77-01276

SOIL MOISTURE USE BY VELVET MESQUITE (PROSOPIS JULIFLORA),
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2G.
W77-01283

RESPONSE OF WHEAT UNDER SUB-HUMID IRRIGATED CONDITIONS TO ATMOSPHERIC MISTING DURING GRAIN FILLING,
International Maize and Wheat Improvement Centre, Londres (Mexico).
For primary bibliographic entry see Field 3F.
W77-01284

THE EFFECT OF ENVIRONMENTAL FACTORS ON THE GROWTH OF A NATURAL PASTURE,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
D. Wallach.
Agricultural Meteorology, Vol. 15, p 231-244, 1975. 6 fig, 2 tab, 16 ref.

Descriptors: *Mathematical models, *Growth rates, *Environmental effects, *Soil moisture, Semiarid climates, Biomass, Least squares method, Temperature, Pastures, Evapotranspiration, Soil horizons, Moisture content.
Identifiers: *Negev region(Israel).

Using a semi-empirical approach, growth curve
are analyzed for three years for a natural pastur
at the Migda Experimental farm in the Negev re
gion of Israel. To study the dependence of th
growth curves on environmental factors, logisti
equations in which the growth rate R is a functio
of soil moisture or temperature have been use
The parameters that appear are optimized by
non-linear least-squares technique. Soil moistur
is an important variable. Temperature alone is c
no predictive value, but temperature in conjunc
tion with soil moisture is of marginal importanc
The results are quite insensitive to the differe
measures of soil moisture and temperature co
sidered. The fit to the data when R is a function o
both soil moisture and temperature is still not full
satisfactory. It seems that semi-empirical equa
tions can profitably be used to investigate specifi
aspects of crop growth, those dealing with en
vironment interactions. It remains to be see
whether it is possible to find simple equatio
which would be fully adequate as predictive tool
(Jamail-Arizona)
W77-01285

SIMULATION OF EVAPOTRANSPIRATIO AND DRAINAGE FROM MATURE AN CLEAR-CUT DECIDUOUS FORESTS AN YOUNG PINE PLANTATION,
Forest Service (USDA), Franklin, N.C. Coweet Hydrologic Lab.
For primary bibliographic entry see Field 2D.
W77-01424

ESTIMATING WATER YIELD DIFFERENCE BETWEEN HARDWOOD AND PINE FOREST AN APPLICATION OF NET PRECIPITATIO DATA,
Forest Service (USDA), Grand Rapids, Min
North Central Forest Experiment Station.
For primary bibliographic entry see Field 3B.
W77-01425

BIOLOGY OF THE SNAKEHEAD IN THE SY DARYA BASIN, (IN RUSSIAN),
G. M. Dukravets, and A. I. Machulin.
Izv Akad Nauk Kaz SSR Ser Biol. 6, p 40-42, 197

Descriptors: Fish, *Fish populations, River Biology.
Identifiers: Ophiocephalus-argus-warpachowski *Snakehead, *Syr-darya River, *USSR, Uzbek SSR.

The Amur snakehead Ophiocephalus argus wa
pachowskii entered a basin of the Syr Darya Rive
in the early 1960's while herbivorous fishes wer
being hauled to pond fisheries of the Uzbek SS
(USSR). By 1964 it had spread to the lowe
reaches of the river and at present has firml
colonized the entire basin of the Syr Darya an
estuarine parts of the Aral Sea. Data are presente
on the size, age, growth, fecundity, reproductio
and feeding of the snakehead in lakes of the lowe
reaches of the Syr Darya. Its growth has slowe
slightly, fecundity has increased, the diet has e
panded and the character of sexual maturation
undergoing changes toward single spawning.
Copyright 1975, Biological Abstracts, Inc.
W77-01427

SOME AQUATIC VERTEBRATES FROM TH NAMIB DESERT, SOUTH WEST AFRICA,
South West Africa Administration, Windhoek Div. of Nature Conservation and Tourism.
J. E. W. Dixon, and M. J. Blom.
Madoqua, Series II, Vol 3 (69-73), p. 31-32, (1974)

Descriptors: *Fish populations, Freshwater fish *Africa, Deserts, Tilapia, Carp, *Distributio Fish stocking, Fisheries, Ponds.
Identifiers: *South West Africa, *Namib Deser Tilapia mossambica, Barbus anoplus, Hepseti breviceps, Pyxicephalus delalandei, Bream.

occurrence of the bream Tilapia mossambica
ers from pools in the Namib Desert is docu-
nted. The aquatic vertebrates Cyprinus carpio,
bus anoplus. Hepsetia breviceps and Pyx-
halus delalandei are also listed. The origin and
ersal of T. mossambica stock in South West
ica is discussed. Amongst established fresh-
er fish populations many individuals show
s of malnutrition. (South Africa)
7-01493

E INFLUENCE OF SOIL MOISTURE AFTER
ANTING ON THE GROWTH AND DIF-
RENTIATION OF THE PEDUNCULATE OAK
ERCUS PEDUNCULATA EHRH. VAR. TAR-
LORA CZER, (IN BULGARIAN),
est Research Inst., Sofia (Bulgaria).
D. Kostov, and T. Naydenova-Yaneva.
sko Stop Nauka. 11(2), p 9-13, 1974.

criptors: *Soil-water-plant relationships, *Soil
sture, *Plant growth, *Oak trees, *Growth
s.
ntifiers: Quercus-pedunculata-var-tardiflora.

dlings were subjected to the effect of varying
rees of soil moisture (100, 85, 70, 55, 40 and
of the maximum water-holding capacity). The
sture degree in the separate treatments was
ntained in the 1st yr after planting, while dur-
the next 4 yr conditions were similar and soil
sture in all treatments was about 85% of the
imum waterholding capacity. The drought in
1st yr after planting had affected the growth of
greater part of the young seedlings. After the
er regimen of the soil was improved, the dif-
ntiation of the seedlings became more marked,
ecially those that were grown at 40 and 25% of
soil moisture in the 1st yr. The ratio was lowest
ween the weight of the root system and the
ght of seedlings (2.3), grown at 100% of the
imum waterholding capacity of the soil, and
highest (4.9) in those that were grown at a
sture of 55% of the maximum waterholding
acity of the soil.--Copyright 1975, Biological
tracts, Inc.
7-01498

TER-RETAINING CAPACITY OF THE
OTS OF SEVERAL FOREST TREE SPECIES,
BULGARIAN),
Forest Experiment Station, Burgas
lgaria).
Manolova, and I. Palashev.
sko Stop Nauka. 11(2), p 14-19, 1974.

criptors: *Trees, *Forests, *Root systems,
ter storage, Drought tolerance, Deciduous
s, Coniferous trees, Pine trees, Douglas fir
s.
ntifiers: Fagus-orientalis, Picea-excelsa, Popu-
deltoides, Pseudotsuga-douglas, Quercus-spp,
ous-torminalis, Tilia-argentea.

skeletal roots of certain coniferous and
duous species, which grow in plantations and
atural forest stands in the area of the Strandja
showed considerable differences in relation
eir water contents. Of the deciduous species,
ulus deltoides Marsh. had the highest water
ent-208%, followed by Tilia argentea Desf.-
%; the lowest, in Quercus cerris L., Q. pu-
ens Willd. and Q. rubra L. 45-63%. Q. ses-
lora Salisb., Q. conferta Kit., Sorbus tor-
alis (L.) Crantz and Fagus orientalis Lipsky
water content ranging 71-78%. In coniferous
ies, the skeletal roots of Pinus maritima Mill.
P. nigra Arn. have higher water contents (185-
%), as compared with the roots of P. sylvestris
nd Picea excelsa Link.--147-149%. The lowest
er content was seen in Pseudotsuga douglas
.--122%. The trees have different capacities to
n the water in their skeletal roots under ex-
ely dry conditions. The more drought-re-
nt species (Quercus sp., Pinus sp.,) evaporate
sture at a slower and more uniform rate, while
mesophytic plants (Populus sp., Tilia sp., Fagus sp., Picea sp.) do so more rapidly and more erratically.--Copyright 1975, Biological Abstracts, Inc.
W77-01504

PRECIPITATION OF CALCIUM AND STRONTIUM SULFATES AROUND PLANT ROOTS AND ITS EVALUATION,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
G. L. Malzer, and S. A. Barber.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 492-495, May-June 1975. 2 fig, 2 tab, 8 ref.

Descriptors: *Calcium, *Strontium, *Sulfates, Root system, Chemical precipitation, *Corn(Field), Analytical techniques, Plant physiology.
Identifiers: *Plant roots, Autoradiographic techniques.

The flux of Ca2+, Sr2+, and SO4(2-) to corn roots was investigated to determine if accumulation at the root caused precipitates to form and if so to determine the influence of precipitate formation on Ca and Sr uptake. Autoradiographic techniques using 45Ca and 35S showed both Ca2+ and SO4(2-) accumulated at root surfaces when supply be mass-flow exceeded uptake. Petrographic studies of the roots confirmed the formation of CaSO4 precipitates. (Skogerboe-Colo St)
W77-01514

2J. Erosion and Sedimentation

TOTAL MINERAL DISSOLVED TRANSPORT BY WORLD MAJOR RIVERS,
Paris Univ., Orsay (France). Ecol Normale Superieure; and Paris Univ. (France). Laboratoire de Geologie.
For primary bibliographic entry see Field 5B.
W77-01135

STOCHASTIC CHARACTERISTICS OF SEDIMENT MOTIONS,
Singapore Univ. Dept. of Civil Engineering.
H. F. Cheong, and H. W. Shen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 102, No HY7, Proceedings Paper No 12269, p 1035-1049, July 1976. 9 fig, 8 ref, 2 append. NSF ENG74-03037.

Descriptors: *Bed load, *Sediment transport, *Correlation analysis, *Statistical methods, *Tracers, Dispersion, Probability, Laboratory tests, Analysis, Sediment discharge, River beds, Radioisotopes, Equations, Radioactivity.
Identifiers: Distribution functions.

The stochastic characteristics of the discrete movements of a sand grain moving as bed load under the action of flowing water were examined. Functional relationships between the step length (or rest duration) distributions and the probability of a sand grain making a specified number of steps (or rest durations) over a distance (or time) were derived and compared with the results from radioactive tracer experiments. A technique for determining the behavior of the density functions for step lengths and rest durations was developed. This technique involved determination of the curvature of the autocorrelation function which was constructed from the step length and rest duration data. (Adams-ISWS)
W77-01140

SUBMARINE MEANDERING THALWEG AND TURBIDITY CURRENT FLOWING FOR 4,000 KM IN THE NORTHWEST ATLANTIC MID-OCEAN CHANNEL, LABRADOR SEA,
McGill Univ., Montreal (Quebec). Dept. of Geological Sciences.
For primary bibliographic entry see Field 2L.
W77-01150

RADIONUCLIDES IN CHESAPEAKE BAY SEDIMENTS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2L.
W77-01188

GEOMETRY OF RIVER MEANDERS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 2E.
W77-01340

NATURAL FILTERING OF SUSPENDED SOIL BY A STREAM AT LOW FLOW,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W77-01428

STREAMFLOW NITROGEN LOSS FOLLOWING FOREST EROSION CONTROL FERTILIZATION,
Forest Service (USDA), Portland, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-01431

SEVENTEEN-YEAR SEDIMENT PRODUCTION FROM A SEMIARID WATERSHED IN THE SOUTHWEST,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-01433

METAL ENRICHMENT OF SEDIMENTS IN INLAND WATERS - THE HARTBEESPOORT DAM,
Pretoria Univ. (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-01487

VORTEX VELOCITY PREDICTION WITH EMPHASIS DIRECTED TOWARD VORTEX TUBE SEDIMENT TRAP DESIGN,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W77-01520

2K. Chemical Processes

TOTAL MINERAL DISSOLVED TRANSPORT BY WORLD MAJOR RIVERS,
Paris Univ., Orsay (France). Ecol Normale Superieure; and Paris Univ. (France). Laboratoire de Geologie.
For primary bibliographic entry see Field 5B.
W77-01135

PERCOLATION OF SURFACE-APPLIED WATER IN THE FIELD,
Kentucky Agricultural Experimental Station, Lexington.
For primary bibliographic entry see Field 2G.
W77-01137

COUPLING PHENOMENA IN SATURATED HOMO-IONIC MONTMORILLONITE: I. EXPERIMENTAL,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 2G.
W77-01138

NITRATE AND CHLORIDE POLLUTION OF AQUIFERS: A REGIONAL STUDY WITH THE AID OF A SINGLE-CELL MODEL,
Tahal-Water Planning for Israel, Ltd. Tel-Aviv.
For primary bibliographic entry see Field 5B.
W77-01145

THE EFFECT OF PRESSURE ON THE IONIZATION OF BORIC ACID IN SODIUM CHLORIDE AND SEAWATER FROM MOLAL VOLUME DATA AT 0 AND 25 C,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
G. K. Ward, and F. J. Millero.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A021 557, Price codes: A02 in paper copy, A01 in microfiche. Geochimica et Cosmochimica Acta, Vol 39, p 1595-1604, 1975. 3 fig, 7 tab, 49 ref.

Descriptors: *Ionization, *Chemical properties, *Pressure, *Sodium chloride, *Sea water, Chemical reactions, Ions, Chemistry, Electrolytes, Boron, Water properties, Inorganic compounds, Physical properties, Water pressure.
Identifiers: *Boric acid, Sodium borate, *Ionizations constants, Chemical equilibrium, *Ionization equilibria, Pressure effects, NaCl, B(OH)3, NaB(OH)4, Nonelectrolytes, Molal volume, Partial molal volume, Boric acid ionization, Temperature effects.

The apparent molal volume of boric acid, B(OH)3, and sodium borate, NaB(OH)4, has been determined in 35,000 mg/l salinity seawater and 0.725 molal NaCl solutions at 0 and 25 C from precise density measurements. Similar to the behavior of nonelectrolytes and electrolytes in pure water, the molal volume of B(OH)3 is a linear function of added molarity. The molal volume of NaB(OH)4 is a linear function of the square root of added molarity in seawater and NaCl solutions. This paper presented results of studies of B(OH)3 in 0.725 molal NaCl solutions. The partial molal volumes of B(OH)3 and NaB(OH)4 in seawater and NaCl were determined from the apparent molal volume by extrapolating to infinite dilution in the medium. The partial molal volume of B(OH)3 was larger in seawater than pure water, apparently due to the ability of electrolytes to dehydrate the nonelectrolyte B(OH)3. The partial molal volume of NaB(OH)4 in itself, NaCl, and seawater was larger than the expected value at 0.725 molal ionic strength due to ion pair formation. The volume change for the ionization of B(OH)3 in NaCl and seawater was determined from the molal volume data. Values of partial molal volumes = -29.2 and -25.9 ml/mol were found in seawater, and partial molal volumes = -21.6 and -26.4 in NaCl, respectively, at 0 and 25 C. The effect of pressure on the ionization of B(OH)3 in NaCl and seawater at 0 and 25 C determined from the volume change was in excellent agreement with direct measurements in artificial seawater (Culberson and Pytkowicz, 1967) and natural seawater (Culberson and Pytkowicz, 1968). (Henley-ISWS)
W77-01190

THE ENVIRONMENTAL CHEMISTRY OF COPPER (II) IN AQUATIC SYSTEMS,
Australian Atomic Energy Commission Research Establishment, Lucas Heights, Div. of Chemical Technology.
For primary bibliographic entry see Field 5B.
W77-01257

THEORETICAL MODEL FOR THE FORMATION OF ION-PAIRS IN SEAWATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
D. R. Kester, and R. M. Pytkowicz.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-021 618, Price code: A02 in paper copy, A01 in microfiche. Marine Chemistry, Vol. 3, p 365-374, 1975. 2 fig, 4 tab, 26 ref. NR 083-102. NSF GA-36057X, ONR N00014-67-A-0369-0007.

Descriptors: *Mathematical models, *Sea water, Theoretical analysis, *Model studies, *Ions, Mathematics, Analytical techniques, Chemical reactions, Electrolytes, Sulfates, Calcium sulfate, Carbonates, Fluorides, chlorides, Oceans, Calcium carbonate, Sodium sulfate.
Identifiers: *Ion-pairs, Ion-pair formation, *Ion-pair models, *Electrostatic, Borate, Sodium fluoride, Sodium carbonate, Sodium bicarbonate, Calcium fluoride.

Predictions of association constants for ion-pair formation in seawater were compared to measured constants as a test for the existence of ion-pairs. A fair agreement was obtained in most cases, although the theoretical electrostatic calculations indicate that significant chloride ion-pairing should occur which has not been observed in most experimental investigations. (Henley-ISWS)
W77-01341

GEOPHYSICAL EXPLORATION FOR POTABLE GROUNDWATER SUPPLIES IN THE KALAHARI GEMSBOK NATIONAL PARK,
Ruker (Richard) and Associates, Bryanston (South Africa).
For primary bibliographic entry see Field 4B.
W77-01366

NUTRIENT RECYCLING AND THE STABILITY OF ECOSYSTEMS: IMPLICATIONS FOR FOREST MANAGEMENT IN THE SOUTHEASTERN U.S.,
Forest Service (USDA), Franklin, N. C. Coweeta Hydrologic Lab.
J. B. Waide, and W. T. Swank.
In: America's Renewable Resource Potential - 1975: The Turning Point, Proceedings, 1975 National Convention, Society of American Foresters, September 28-October 2, 1975, Washington, D. C., Society of American Foresters, Washington, D. C., p. 404-424. 4 fig, 5 tab, 30 ref.

Descriptors: *Nitrogen cycle, *Forest management, *Ecosystems, Productivity, Coniferous forests, Deciduous forests, *Southeast U.S., Nutrients, Recycling, *Cycling nutrients.
Identifiers: Relative stability.

A conceptual framework of elemental cycles was successfully applied to analyses of the nitrogen cycle in deciduous hardwoods and loblolly pine, which are two important southeastern forest ecosystem types. The relative stability of these ecosystems was defined in terms of resistance and resilence, and the impact of alternative levels of tree utilization on subsequent productivity after several rotations was evaluated. Results establish the relevance of ecosystem relative stability to practical mangement problems. (Forest Service)
W77-01420

THE RELATIONSHIP BETWEEN NITRATE CONCENTRATIONS IN THE SOUTHERN APPALACHIAN MOUNTAIN STREAMS AND TERRESTRIAL NITRIFIERS,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W77-01423

STREAMFLOW NITROGEN LOSS FOLLOWING FOREST EROSION CONTROL FERTILIZATION,
Forest Service (USDA), Portland, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-01431

HYDROGEOLOGICAL AND GEOPHYSIC
INVESTIGATIONS OF A GEOTHERM
ANOMALY IN HUNGARY; II. GEOTHERM
FLOW SYSTEM IN THE TISZAKECSKE
GION,
Research Inst. for Water Resources Developme
Budapest (Hungary).
For primary bibliographic entry see Field 4B.
W77-01436

AMELIORATION OF SUBSURFACE ACIDI
BY LEACHING OF SURFACE APPLI
AMENDMENTS. A LABORATORY STUDY,
Fruit and Fruit Technology, Research Inst., S
lenbosch (South Africa).
For primary bibliographic entry see Field 2G.
W77-01483

WONDERFUL WATER (WONDERLI
WATER), (IN AFRIKAANS),
P. J. Aucamp.
Spectrum, Vol 13 (2), p 24-26, (1975).

Descriptors: Chemical properties, Physical p
perties, Demineralisation, Distillation, *W
properties, Water treatment.
Identifiers: South Africa.

Described are the physical and chemical pro
ties of water that help to make it the remarka
compound, the mechanics that regulate the
that ice floats instead of sinks, why water h
higher heat capacity than other compounds,
why water is such a good solvent. Vari
methods of purifying tap water are descri
Among the processes described are distillation
demineralisation. (South Africa)
W77-01486

SPECIFIC ADSORPTION OF TRA
AMOUNTS OF CALCIUM AND STRONTI
BY HYDROUS OXIDES OF IRON AND A
MINUM,
Massey Univ., Palmerston North (New Zeala
Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-01513

PRECIPITATION OF CALCIUM AND STR
TIUM SULFATES AROUND PLANT ROO
AND ITS EVALUATION,
Purdue Univ., Lafayette, Ind. Dept. of Agronom
For primary bibliographic entry see Field 2I.
W77-01514

2L. Estuaries

TEMPERATURE VARIATION IN FIDDL
CRAB MICROHABITATS,
Texas Univ. at Austin, Port Aransas. Mar
Science Inst.
For primary bibliographic entry see Field 5C
W77-01058

NITROGEN FIXATION IN THE RHODE RIV
ESTUARY OF CHESAPEAKE BAY,
Maryland Univ. Baltimore County, Baltim
Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-01059

TEMPERATURE AND THE VERTICAL D
TRIBUTION OF TWO TIDEPOOL FISH
(OLIGOCOTTUS MACULOSUS, O. SNYDERI
Southeastern Massachusetts Univ., North D
mouth. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01060

ISTRIBUTION AND SIGNIFICANCE OF ECAL INDICATOR ORGANISMS IN THE PPER CHESAPEAKE BAY,
laryland Univ., College Park. Dept. of licrobiology.
or primary bibliographic entry see Field 5C.
/77-01061

EASONAL SHIFTS IN THE SPAWNING SITE F A NORTHEAST PACIFIC INTERTIDAL ISH,
ritish Columbia Univ., Vancouver, B. C. Inst. of nimal Resource Ecology.
B. Marliave.
ournal of the Fisheries Research Board of anada, Vol. 32, No. 10, October 1975, p 1687-691, 3 fig, 1 tab, 7 ref.

escriptors: Environmental effects, *Fish, Spawning, Temperature, Seasonal, Vaves(Water), On-site investigations, *Pacific cean, Intertidal areas.
lentifiers: *Black prickleback, Xiphister atropur-ureus.

pawning sites of the black prickleback, Xiphister tropurpureus, were studied. Shifts in spawning tes during the winter and spring spawning eriods were observed. This species selects under-oulder substrates of shells, pebbles, and small ocks that provide spaces most nearly matching ne cross-sectional body size of the adults for pawning sites. Spawning occurs under such a ide range of water temperatures from December May that slight temperature variations between tes could not solely account for differences. The easonal shift probably results because wave ac-on decreases as temperatures increase during the pring. (Chilton-ORNL)
/77-01063

EASONAL DISTRIBUTIONS OF LARVAL LATFISHES (PLEURONECTIFORMES) ON HE CONTINENTAL SHELF BETWEEN CAPE OD, MASSACHUSETTS, AND CAPE OOKOUT, NORTH CAROLINA, 1965-66,
ational Marine Fisheries Service, Highlands, N. Sandy Hook Lab.; and National Marine Fishe-es Service, Highlands, N. J. Middle Atlantic oastal Fisheries Center.
. G. Smith, J. D. Sibunka, and A. Wells.
OAA Technical Report NMFS SSRF-691, June 975, 68 p, 72 fig, 16 tab, 44 ref.

escriptors: *Reproduction, *Spawning, Seasonal, *Distribution patterns, Fish, Larvae, ggs, Temperature, On-site investigations, Con-nental shelf, Atlantic Ocean.
lentifiers: Bothids, Pleuronectids, Cynoglossids, Flatfish.

a survey designed to locate spawning grounds nd trace dispersion of fish eggs and larvae on the ntinental shelf, 4 families, 17 genera, and 15 spe-es of fish were studied. The usual time of pawning was in the spring during seasonal tem-erature changes. Bothids have longer spawning easons than pleuronectids, beginning in spring nd continuing through early fall, in the southern alf of the study area. Pleuronectids spawned in e spring in the northern half of the survey area. ynoglossids spawned incidentally off North arolina but most of their larvae were transported to the study area from spawning grounds south Cape Lookout. There were only a few represen-tives of the family Soleidae and these originated outh of Cape Lookout. Onset of spawning was iggered by spring warming and fall cooling with ost species spawning within a relatively narrow nge of temperatures. (Chilton-ORNL)
/77-01064

TATE REGULATION OF COASTAL WATER REA PRESERVES,
iami Univ., Fla., School of Law.
or primary bibliographic entry see Field 6E.
W77-01072

SOME WATER LAW PROBLEMS ASSOCIATED WITH ESTERO BAY, FLORIDA,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01091

TIDAL BOUNDARIES IN FLORIDA,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 6E.
W77-01093

REDEVELOPMENTS ON THE OCEANFRONT,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01100

COASTAL CONSTRUCTION AND OTHER PHYSICAL ACTIVITIES SEAWARD OF THE MEAN HIGH WATER LINE,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01102

WAVE PREDICTION FOR THE EAST COAST OF INDIA UNDER STORM CONDITIONS IN THE BAY OF BENGAL,
Karnataka Regional Engineering Coll., Suratkal (India).
J. Dattatri, and P. Vijaya Kumar.
Indian Journal of Meteorology and Geophysics, Vol. 25, No. 2, p 211-222, April 1974. 9 fig, 1 tab, 15 ref.

Descriptors: *Waves(Water), *Forecasting, *Storms, *Winds, *Asia, Ocean waves, Monsoons, Coasts, Shores, Wavelengths, Graphical analysis, Wind tides, Bays, Oceans, Estuaries, Friction, Fluid friction, Fluid mechanics, Tropical cyclones, Oceanography, Meteorology.
Identifiers: *India, *Bay of Bengal(India), *Wave prediction.

Cyclonic storms are frequent in the Bay of Bengal, particularly during the NE monsoon period. Some of these storms are severe and generate high waves which cause havoc in the coastal regions. This paper presented an analysis of the cyclonic storm which hit coastal Andhra Pradesh on 7 November 1969. Wave prediction under storm conditions involves an analysis of moving fetches and variable wind speeds. Wilson's graphical method incorporating the latest available wave prediction relations was used for wave prediction. The predicted waves which are deep water waves were modified to account for refraction, shoaling, and bottom friction effects as they enter shallower waters. The predicted waves were compared with the waves observed by the Visakhapatnam outer harbor authorities. The results of the analysis suggested that (1) Wilson's graphical method can be applied for wave prediction for Indian coasts under storm conditions, (2) the recommended value of bottom friction factor appears to be low, and (3) waves of considerable height are experienced even in areas not in the direct path of the cyclone. (Sims-ISWS)
W77-01124

HYDROGEOLOGY OF THE QUATERNARY AND TERTIARY FORMATIONS ALONG THE SOUTH COAST OF THE ALGARVE PORTUGAL,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 2F.
W77-01136

NUMERICAL COMPUTATION OF WELL-MIXED ESTUARINE FLOWS,
Lanchester Polytechnic, Coventry (England). Dept. of Civil Engineering.
J. P. Grubert.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 102, No HY7, Proceedings Paper 12255, p 955-967, July 1976. 7 fig, 1 tab, 13 ref, 3 append.

Descriptors: *Coastal engineering, *Estuaries, *Saline water intrusion, *Diffusion, *Tides, Hydraulics, Algorithms, Methodology, Computers, Mathematics, Mathematical studies, Equations, *Mixing.
Identifiers: *Well-mixed estuaries, *India, *River Hoogly, Double-sweep algorithm.

Tidal estuaries are classified, depending on the amount of mixing of the salt and freshwater, into three groups: well mixed, partly mixed, and fully stratified. The flow ratio given by the tidal prism divided by the river discharge during a flood tide exceeds unity for a well-mixed estuary. A numerical model was presented for the computation of flow variables in such an estuary. The numerical method used was an implicit, unconditionally stable, finite difference scheme of second-order accuracy. Data were presented for the scheme in a physically realistic way to avoid nonlinear instabilities, and, for this purpose, the dynamic equations were written in pentadiagonal form and solved with a generalized double-sweep algorithm. The method was applied to the River Hoogly estuary in India. (Singh-ISWS)
W77-01139

MACROPHYTIC ALGAE OF THE VOSTOK BAY (SEA OF JAPAN), (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.
For primary bibliographic entry see Field 5C.
W77-01142

UNSTEADY GROUNDWATER FLOW BENEATH STRIP OCEANIC ISLANDS,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2F.
W77-01143

AN ANALYSIS OF SALINITY VARIATIONS WITHIN GREAT SOUTH BAY, NEW YORK,
Environmental Defense Fund, East Setauket, N. Y.
P. D. Moskowitz.
Limnology and Oceanography, Vol. 21, No. 5, p 740-742, September 1976. 5 fig, 10 ref.

Descriptors: *Tidal waters, *Salinity, *Bays, *Lagoons, *New York, *Mixing, Streamflow, Outlets, Sewers, Low flow, Discharge(Water), Freshwater.
Identifiers: *Long Island, *Great South Bay(NY), *Salinity variations, *Tidal lagoons, Freshwater discharge-salinity relationships.

A series of correlation coefficients comparing streamflows with Great South Bay salinities indicated that changes in salinity observed within the bay were statistically associated with variations in streamflow. No significant correlation between salinity and rainfall was observed. The results may have significance to outfall sewering on Long Island. (Bender-ISWS)
W77-01149

SUBMARINE MEANDERING THALWEG AND TURBIDITY CURRENT FLOWING FOR 4,000 KM IN THE NORTHWEST ATLANTIC MID-OCEAN CHANNEL, LABRADOR SEA,
McGill Univ., Montreal (Quebec). Dept. of Geological Sciences.
S. Chough, and R. Hesse.

Geology, Vol. 4, No. 9, p 529-533, September 1976. 6 fig, 21 ref.

Descriptors: *Atlantic Ocean, *Turbidity, *Turbidity currents, *Thalweg, Sediment transport, Sedimentation, Meanders, Oceanography, Oceans, Channel morphology, Channels.
Identifiers: *Labrador Sea, *Deep sea channel, *Submarine meandering thalweg, Mid-ocean channel.

For the first time, the existence of a meandering thalweg and associated point bars was documented in detail for a mid-ocean channel. It was found that in the world's largest deep-sea channel, the Northwest Atlantic Mid-Ocean Channel of the Labrador Sea, average meander wave length of the thalweg is 50 km between lat 54 degrees and 57 degrees 30 minutes N. The ratio of the meander wave length to channel width was less than that for alluvial channels. Sediments recovered from the channel and natural levees were indicative of sedimentary mass transport in the channel by turbidity currents and related processes, some of which probably extended the entire length of the channel. (Lee-ISWS)
W77-01150

MODELING PHYTOPLANKTON BLOOMS IN A STRATIFIED EMBAYMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5C.
W77-01163

RADIONUCLIDES IN CHESAPEAKE BAY SEDIMENTS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
P. J. Cressey, Jr.
NASA Technical Note D-8196, 20 p, April 1976. 19 fig, 8 tab.

Descriptors: *Radioisotopes, *Radioactivity, *Bottom sediments, *Chesapeake Bay, *Radiochemical analysis, *Sediments, Bays, Fallout, Water quality, Radioactive wastes, Chemical analysis, Instrumentation, Nuclear powerplants, Cesium, Cobalt, Thallium radioisotopes, Estuaries, Analytical techniques, Nuclear physics, Nuclear powerplants.
Identifiers: *Radiochemical testing, Surface sediments, Natural radioactivity, Nuclear fallout, Trace minerals, Analytical methods, Bismuth 214, Ruthenium 106, Radiochemical sampling, Natural radionuclides, Manmade radionuclides.

Natural and manmade gamma-ray emitting radionuclides were measured in Chesapeake Bay sediments taken near the Calvert Cliffs Nuclear Power Plant site. Samples represented several water depths at six locations for five dates encompassing a complete seasonal cycle. Radionuclide contents of dry sediments ranged as follows: T1208, 40 to 400 pCi/kg; Bi214, 200 to 800 pCi/kg; K, 0.04 to 2.1%; Cs137, less than 5 to 1900 pCi/kg; Ru106, less than 40 to 1000 pCi/kg; Co60, less than 1 to 27 pCi/kg. In general, radionuclide contents were positively correlated with each other and negatively correlated with sediment grain size. (Henley-ISWS)
W77-01188

THE EFFECT OF PRESSURE ON THE IONIZATION OF BORIC ACID IN SODIUM CHLORIDE AND SEAWATER FROM MOLAL VOLUME DATA AT 0 AND 25 C,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 2K.
W77-01190

OCEANOGRAPHIC APPARATUS,
General Dynamics Corp., St. L...is, Mo. (Assignee).
E. L. Casco, and R. F. Kosic.
U. S. Patent No. 3,968,954, 15 p, 12 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 948, No 2, p 566, July 13, 1976.

Descriptors: *Patents, *Instrumentation, *Oceans, *Sea water, Water properties, *Measurement, Temperature, Pressure, Conductivity, Oceanography.
Identifiers: Reeling systems, Reels, Sensors, Deployment and recovery.

The invention relates to oceanographic apparatus and particularly to a reeling system which is adapted to deploy and retrieve a sensor body which is attached to a line or cable so that measurements of ocean characteristics may be made through the use of the sensor. It is especially suitable for use in obtaining data from which a profile of ocean characteristics with respect to depth can be made. It is also suitable for use in other oceanographic apparatus in which cables or lines are deployed and retrieved. A cable, at the end of which is attached a sensor, is wound around a reel having a flange in which a spiral cam is formed. In order to deploy the sensor, the reel is adapted to tilt to a downward vertical position so as to permit free fall of the sensor and cable over the cam flange and through a fairlead which may be secured in and extending through the hull of an ocean data buoy. The reel is tilted to a horizontal position and rotated in order to retrieve the sensor, the cam flange guiding the cable onto the hub of the reel which may be rocked during winding so as to obtain a level wind on the reel hub. The fairlead protects the sensor once it is retrieved. During free fall, the weight distribution and shape of the sensor provides for stability and a constant drop rate. Data (such as temperature, pressure and conductivity) is transmitted to the surface via a conductor in the cable and using sea water as a return path. (Sinha-OEIS)
W77-01214

BREAKWATER CONSTRUCTION,
Raymond International, Inc., Houston, Tex. (Assignee).
For primary bibliographic entry see Field 8B.
W77-01221

FLOATING BREAKWATERS,
Ishikawajima-Harima Heavy Industries Co., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 8B.
W77-01222

IN-SITU OCEANOGRAPHIC SAMPLE SEPARATOR,
Office of the Secretary (Navy), Washington, D.C.
S. J. Niskin.
U.S. Patent No. 3,969,925, 7 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 948, No 3, p 894, July 20, 1976.

Descriptors: *Patents, *Sampling, *Water sampling, *Testing, *On-site investigations, *On-site tests, Suspended solids, Separation techniques, Oceanography.
Identifiers: Particulate separator.

Water samples in most investigations must be brought to the surface where particulate matter is separated, treated, and then lowered agin for a period of incubation at the natural depth environment. This procedure subjects the particulate matter sample to changing environmental conditions as well as to possible contamination. Since separation of the samples from the captured water is usually conducted in a laboratory, an additional opportunity for contamination is introduced. This invention, a sampling device for in situ oceanographic investigations includes a sample chamber in which water samples are received and exited by a dual-valve arrangement. The valves are messenger-actuated in two discrete steps, the first step involving actuating the sampler, filling its chamber with water, injecting a tracer solution, and allo... ing the particulate sample matter to incubate. T... second step, independently messenger-actuate... causes the release of compressed gas into t... chamber via a manifold, forcing the contain... water out through an appropriate filter after whi... the sampling device is recovered empty of all co... tents except whatever particulate matter has be... collected by the filter which matter is immediate... ready for laboratory analysis. (Sinha-OEIS)
W77-01223

BREAKWATER SYSTEM FOR CREATING A... TIFICIAL SANDBARS,
For primary bibliographic entry see Field 8B.
W77-01231

KEPONE: HAZARD TO AQUATIC ORGA... ISMS,
Environmental Protection Agency, Gulf Bree...
Fla. Gulf Breeze Lab.
For primary bibliographic entry see Field 5C.
W77-01235

THE EFFECTS OF THERMAL EFFLUENT ... THE AMERICAN OYSTER, CRASSOSTR... VIRGINICA GMELIN IN INDIAN RIVER BA... DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studi...
For primary bibliographic entry see Field 5C.
W77-01237

THE EFFECT OF TEMPERATURE ON T... BEHAVIOR OF YOUNG TAUTOG, TAUTO... ONITIS (L.),
National Marine Fisheries Service, Highlan...
N.J. Sandy Hook Lab.
For primary bibliographic entry see Field 5C.
W77-01241

SPATIAL DISPERSION OF AN ESTUARI... BENTHIC FAUNAL COMMUNITY,
Swedish Water and Air Pollution Research La...
Goteborg.
For primary bibliographic entry see Field 5B.
W77-01246

PCB CONTENTS IN MARINE ANIMALS C... LECTED IN THE EAST CHINA SEA, ... JAPANESE),
Hokkaido Univ., Sapporo (Japan). Lab. of F...
Hygiene.
For primary bibliographic entry see Field 5C.
W77-01255

ACUTE TOXICITIES OF CRUDE OILS A... OIL-DISPERSANT MIXTURES TO RED S... FISHES AND INVERTEBRATES,
Hebrew Univ., Jerusalem (Israel). Heinz Stei...
Marine Biology Lab.
For primary bibliographic entry see Field 5C.
W77-01256

LATENT EFFECTS OF IRANIAN CRUDE ... AND A CHEMICAL OIL DISPERSANT ON R... SEA MOLLUSCS,
Hebrew Univ., Jerusalem (Israel). Heinz Stei...
Marine Biology Lab.
For primary bibliographic entry see Field 5C.
W77-01262

ARE HOVERCRAFT A MAJOR CAUSE ... DISTURBANCES TO INERTIDAL INV... TEBRATES,
Institute of Terrestrial Ecology, Norw...
(England). Colney Research Station.
For primary bibliographic entry see Field 6G.
W77-01263

OPTIMUM ALLOCATION STRATEGIES FOR SAMPLING BENTHOS IN THE NEW YORK BIGHT,
Rhode Island Univ., Kingston. Marine Experiment Station.
For primary bibliographic entry see Field 5A.
W77-01264

THE ACCUMULATION OF PCB AS A FUNCTION OF GROWTH IN JAPANESE ANCHOVY CAUGHT IN OSAKA BAY, (IN JAPANESE),
Osaka Prefectural Fisheries Experimental Station, Japan).
For primary bibliographic entry see Field 5C.
W77-01265

MERCURY IN EGGS OF NORWEGIAN SEABIRDS,
Tromsoe Univ. (Norway). Inst. Biology and Geology.
For primary bibliographic entry see Field 5A.
W77-01267

MEAN HIGH WATER MARK AND USE OF TIDELANDS IN FLORIDA,
Florida State Dept. of Health and Rehabilitative Services, Vero Beach. Medical Entomology Lab.
M. W. Provost.
Fla Sci. 36(1), p 50-66, 1973.

Descriptors: *Florida, *Tidal waters, *Water levels, *Tidal marshes, Marshes, *High water mark.
Identifiers: *Tidelands.

An analysis of ocean tide patterns is used to explain the difficulties in determining the mean high water mark in Florida (USA). Seasonal oscillations of the sea are so related to tide intervals that a submergence periodicity on the tidelands is created which is unique to the state. The high marsh remains dry during 1 part of the yr and is almost continuously tide-flooded during the other. Important differences between Atlantic and Gulf coasts are demonstrated. The high marsh, located between mean neap high and mean spring high tide levels, occupies more of the tidelands in Florida than the low marsh. For the protection of tidelands it is recommended that they be delineated by their vegetation until more tidal bench marks are available.--Copyright 1975, Biological Abstracts, Inc.
W77-01279

WAVES IN COASTAL WATERS OFF MANGALORE; PT. I: DISTRIBUTION OF WAVE CHARACTERISTICS,
Naval Physical and Oceanographic Lab., Cochin India).
K. V. Sundara Raman, M. J. Varkey, P. K. Vijayarajan, V. C. John, and M. X. Joseph.
Indian Journal of Meteorology and Geophysics, Vol. 25, Nos. 3 and 4, July and October 1974. 7 fig, 1 tab, 13 ref.

Descriptors: *Waves(Water), *Pressure measuring instruments, *Ocean waves, *Measurement, On-site investigations, Data processing, Analytical techniques, Oceans, Bays, Coasts, Energy, Frequency, Oceanography.
Identifiers: *India, Wave heights, Wave periods, Energy spectra.

A pressure recorder for measuring sea waves had been installed off MangaLore. Wave record obtained from the recorder were analyzed, and wave parameters like period, height, etc., were obtained for the period June 1968 to May 1969. Frequency distribution of wave heights and wave periods during various months was drawn. Energy spectra obtained from data were presented. From the study of the distributions of wave parameters, it was found that period follows normal distribution, and the height follows Rayleigh distribution. The energy spectra were composite in nature, giving the average condition for a month when the record for the whole month was considered as a single record. (Sims-ISWS)
W77-01330

THEORETICAL MODEL FOR THE FORMATION OF ION-PAIRS IN SEAWATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2K.
W77-01341

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1971-SEPTEMBER 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W77-01416

THE BENTHOS OF SOME SOUTHERN AFRICAN LAKES PART 3: THE BENTHIC FAUNA OF LAKE NHLANGE, KWAZULU, SOUTH AFRICA,
Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology; and Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 2H.
W77-01437

TEMPERATURE RECORDING IN SHALLOW MARINE ENVIRONMENTS,
Cape Town Univ. (South Africa). Dept. of Zoology.
A. H. Fricke, and A. B. Thum.
Trans. Roy. Soc. S. Afr. Vol 41, Part 4, p 351-357, (1975). 3 fig, 13 ref.

Descriptors: *Shallow water, Equipment, *Temperature, Measuring instruments, *Reproduction, Animal behavior, Coasts.
Identifiers: South Africa, Parechinus angulosus, *Sea urchins.

The shallow inshore water masses around the Cape coast are mixed with regard to temperature and frequently experience marked fluctuations. We needed a device giving a continuous record of in situ temperature to investigate its effect on the reproductive behaviour of Parechinus angulosus Leske, a common local sea urchin. Commercial temperature recorders were enclosed in watertight housings designed for the purpose and installed on the sea-bed at the study sites. (South Africa)
W77-01446

METHANE, CARBON DIOXIDE, AND DISSOLVED SULFATE FROM INTERSTITIAL WATER OF COASTAL MARSH SEDIMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5B.
W77-01495

PHYTOPLANKTON DIVERSITY AHD CHLOROPHYLL-A IN A POLLUTED ESTUARY,
Montclair State Coll. Upper Montclair, N. J. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01499

SHELL DISEASE IN CRABS AND LOBSTERS FROM NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Lab.
For primary bibliographic entry see Field 5C.
W77-01500

ARTIFICIAL ISLANDS: INFORMATION NEEDS AND IMPACT CRITERIA,
Delaware Univ., Lewes. Marine Studies Center.
For primary bibliographic entry see Field 6G.
W77-01501

INCIDENCE OF SHELL DISEASE IN SHRIMP IN THE NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Lab.
For primary bibliographic entry see Field 5C.
W77-01502

CULTURE STUDIES ON THE EFFECTS FROM BORATE POLLUTION ON THE GROWTH OF MARINE PHYTOPLANKTERS,
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
For primary bibliographic entry see Field 5C.
W77-01506

ACUTE TOXICITY OF CHLORINE TO SELECTED ESTUARINE SPECIES,
Virginia Inst. of Marine Sciences, Gloucester Point.
For primary bibliographic entry see Field 5C.
W77-01508

THE EFFECT OF THE PRELIMINARY ADAPTATION TEMPERATURE ON THE DISTRIBUTION OF JUVENILE COD (GADUS MORHVA) AND POLLOCK (POLLACHIUS VIRENS) WITHIN A TEMPERATURE GRADIENT,
Murmanskii Morskoi Biologicheskii Institut (USSR).
For primary bibliographic entry see Field 5C.
W77-01509

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WATER LAW AND NEW TECHNOLOGIES.
United Nations, New York.
For primary bibliographic entry see Field 6E.
W77-01184

PROCESS FOR EXTRACTING DISSOLVED SALTS FROM WATER,
Dames and Moore, San Francisco, Calif. (Assignee).
C. W. Garbe.
U.S. Patent No. 3,966,539, 4 p, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2226, June 29, 1976.

Descriptors: *Patents, *Desalination, *Demineralization, *Separation techniques, *Evaporation, *Evaporation control, Water treatment, Saline water, Air-water interfaces, Settling basins, Thin films, Solar radiation.

A process is described for concentrating salt dissolved in a salt-saturated water by accelerated evaporation. It has been found that water evaporates rapidly from thin films in the range of 1 to 2 mils thickness which can be developed over a mixture of suspended solids in water. A particulate solid is selected having a density which exceeds that of the salt-saturated liquid and preferably exceeds the density of the salt-saturated liquid by a factor of about 2.0. The solid particulate matter is then mixed with the salt-containing solution to form a slurry. The atmosphere-exposed surface of the slurry is periodically agitated to produce a uniform mixture at the surface from which the suspended particles begin to settle, yielding the thin film of water. The film thickness increases as

the particle settlement progresses and achieves the optimum for evaporation. Agitation is effected periodically to prevent the formation of a dry surface skin over the slurry. When the concentration of the salt dissolved in the water within the slurry approaches the saturation level, agitation of the slurry ceases. Complete settlement of the solid particulate matter is then permitted. The liquid is then decanted from the top of the slurry close to its point of saturation, and is coventionally processed (by solar evaporation) to cause crystallization of the desired salt. (Sinha-OEIS)
W77-01198

MULTI-STAGE FLASH DISTILLATION PLANT,
Agency of Industrial Science and Technology, Tokyo (Japan). (Assignee).
T. Mukushi, K. Izumi, S. Takahashi, Y. Okazima, and T. Sawa.
U.S. Patent No. 3,966,562, 6 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2232-2233, June 29, 1976.

Descriptors: *Patents, *Desalination, *Sea water, Saline water, Separation techniques, Distillation, Flash distillation, Water purification, Equipment.

A multi-stage distillation plant consists of a multi-flash evaporator provided with a multi-flash chamber which is divided into a heat recovery section and a heat rejection section. The flash evaporator is provided with a deaerator for deaerating cold sea water, a thickener for separating brine containing a relatively great amount of seeds, from concentrated brine which has been extracted from a front chamber of the final stage flash chamber, and a seed mixing tank for obtaining a seed-mixed brine. Part of the sea water which has passed through the deaerator is supplied as a feed sea water to the rear chamber of the final stage flash chamber. The brine containing relatively great amount of seed and extracted from the thickener is joined to the seed-mixed brine fed from the seed mixing tank. Thus, the confluent brine thus joined together is discharged for deaeration into the final stage flash chamber from a distributor provided in the rear chamber. (Sinha-OEIS)
W77-01199

METHOD FOR PREVENTING SCALE IN SALINE WATER DESALTING APPARATUS AND SALINE WATER RECLAMATION APPARATUS FOR CARRYING OUT SAID METHOD,
Ishikawajima-Harima Engineering Review, Tokyo (Japan). (Assignee).
J. Sakuma, and S. Takahashi.
U. S. Patent No. 3,969,193, 5 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 948, No 2, p 641, July 13, 1976.

Descriptors: *Patents, *Desalination, *Demineralization, *Saline water, *Waste water treatment, Scaling, *Descaling, Acids, Hydrogen ion concentration, Corrosion control.

A method for use in a flash distillation apparatus for saline water desalting is provided for removing the scale formed from saline water and accumulated upon the heating surfaces of the apparatus before the growth of the scale starts. During the time the desalting operation is being performed, an acid is added to the saline water for short periods at predetermined time intervals immediately before entering and/or in the course of the condensation and heating passages of the whole system of the condensation, heating and heat-recovery passage for saline water. The periodically introduced acid thereby repetitively dissolves and removes alkali scale formed upon the heating surfaces at the stage at which very fine nuclei of scale are formed. (Sinha-OEIS)
W77-01215

THE REMOVAL OF SALT AND ORGANIC MATERIAL FROM SEWAGE EFFLUENT BY ANION EXCHANGE RESINS,
Cape Town Univ. (South Africa). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W77-01364

WONDERFUL WATER (WONDERLIKE WATER), (IN AFRIKAANS),
For primary bibliographic entry see Field 2K.
W77-01486

3B. Water Yield Improvement

A TECHNIQUE FOR PREDICTING THE AQUATIC ECOSYSTEM RESPONSE TO WEATHER MODIFICATION,
Utah Center for Water Resources Research, Logan.
E. K. Israelsen, D. R. Bernard, T. M. Twedt, and H. M. Runke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 492, Price codes: A08 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Publication PRWG138-1, December 1975. 157 p, 21 fig, 21 tab, 148 ref, 3 append. OWRT B-105-UTAH(1). 14-31-0001-4135.

Descriptors: Aquatic habitats, Water temperature, Periphyton, Fish reproduction, *Weather modification, *Cloud seeding, *Utah, *Model studies, *Forecasting, *Ecosystems.
Identifiers: Spawn Creek(Utah), Logan(Utah), Logan Canyon(Utah).

In the past, considerable effort has been spent on the development of techniques for increasing precipitation from a given cloud formation. However, little attention has been given to identifying and evaluating the impacts of cloud seeding activities on the aquatic ecosystems within the affected areas. The objective of this study was to apply the simulation technique to predict the impacts of cloud seeding on the aquatic ecosystem within the area subject to weather modification. A small mountain watershed near Logan, Utah, was selected for the study. Measurements were made of the significant parameter levels under current conditions. A hydrologic and water temperature model was calibrated to the watershed to predict the change in water temperature and stream velocities from arbitrary increases in the snowpack. The predicted water velocities and temperatures were used to link the hydrologic system to the aquatic ecosystem which consisted of primary production, invertebrate, and fish communities. The study was conducted over a very short time base, and thus cannot be regarded as being absolutely conclusive, but the results do indicate trends which might be expected if various decreases of water temperature and increases in stream velocity were to occur.
W77-01051

RESULT OF OPERATIONAL CLOUD SEEDING EXPERIMENT OVER RIHAND CATCHMENT IN NORTHEAST INDIA,
Institute of Tropical Meteorology, Poona (India).
R. K. Kapoor, K. Krishna, U. S. De, K. G. S. Nair, and I. C. Talwar.
Indian Journal of Meteorology and Geophysics, Vol. 25, Nos. 3 and 4, p 379-384, July and October 1974. 1 fig, 6 tab, 8 ref.

Descriptors: *Cloud seeding, Weather modification, *Artificial precipitation, Aircraft, Cloud physics, Rainfall, Precipitation(Atmospheric), Weather, Statistics, Data processing, Watersheds(Basins), Reservoirs, Water resources, Meteorology.
Identifiers: *India, *Uttar Pradesh(India), *Rihand Reservoir(India).

A cloud seeding experiment, on operational basis was performed during August-September, 197 over the catchment area of the Rihand reservoir i the state of Uttar Pradesh, India. For unavoidabl reasons, it was not possible to seed on 27 day scattered throughout the experimental period. Th unseeded days were considered control days, an the unseeded areas adjoining the catchment wer considered control areas. The results of the experi ment were evaluated, and the analysis suggested rainfall increase in the seeded catchment area o over 17%. However, the increase was not con sidered to be statistically significant. (Sims-ISWS)
W77-01129

WATER SALVAGE POTENTIALS IN UTAH VOLUME II, EVAPORATION SUPPRESSIO BY RESERVOIR DESTRATIFICATION,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2D.
W77-01164

DRAFT ENVIRONMENTAL STATEMENT PROJECT SKYWATER A PROGRAM O RESEARCH IN PRECIPITATION MANAGE MENT, VOLUME I OF II.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-01187

POTENTIAL FOR WATER YIELD IMPROVE MENT IN ARIZONA THROUGH RIPARIA VEGETATION MANAGEMENT,
Arizona Univ., Tucson. School of Renewabl Natural Resources.
R. S. Affleck.
Ph. D. Dissertation, 1975. 4 fig, 15 tab, 183 ref.

Descriptors: *Water yield improvement, *Wat supply, *Riparian plants, *Vegetation, Hydrolog *Arizona, Riparian land, Desert plants, Ar lands, Biocontrol, Antitranspirants.

New knowledge gained over the past 15 to 20 yea on management of riparian zones in Arizona f water yield improvement has been organized an analyzed. Hydrologic processes and principles a plicable to riparian zones, the distribution and n ture of riparian vegetation in Arizona, and ne resource management methods, needs, and co straints have been evaluated. The relationsh between vegetation management for water yie improvement and other resource-based produc and uses of riparian zones such as timber, rang for livestock, wildlife and fish, recreation, a asthetics has been assessed; the need for a surve of riparian vegetation is cited. Five water yield i provement methods applicable to riparian zon are evaluated: conversion of one vegetation ty to another, channelization, cottonwood thinnin anti-transpirant and biological control treatment (Jamail-Arizona)
W77-01282

SOIL MOISTURE USE BY VELVET MESQUIT (PROSOPIS JULIFLORA),
Arizona Univ., Tucson. School of Renewab Natural Resources.
For primary bibliographic entry see Field 2G.
W77-01283

IS MAN CHANGING THE WEATHER.
National Center for Atmospheric Researc Boulder, Colo.
H. Lansford.
Lantern, Vol XXIII (4), p 2-5, (1974).

Descriptors: *Weather modification, Cloud see ing, Air pollution, Nucleation, Carbon dioxid Dust storms, United States.

There is increasing evidence that man is changi the weather. The author surveys some of the e

eriments and theories that shed light on this im-
ortant and possibly ominous development. He
oints out that cloud-seeding is not only done by
eathermen in weather modification experiments
t that pollutants from automobile exhausts and
om high flying jet aircraft, as well as dust from
dustry and agriculture perform unintentional
oud-seeding sometimes triggering terrific storms
d sometimes overseeding clouds to an extent
here all moisture particles become frozen nuclei,
aving insufficient moisture to make them grow
ger. The effect of carbon dioxide accumulation
the atmosphere, due to the burning of fossil
els and the so-called 'Greenhouse Effect' is also
scussed. (South Africa)
77-01353

OMMENTS ON THE STORAGE OF WATER
APOUR IN THE ATMOSPHERE OVER
OUTH AFRICA,
atal Univ., Pietermaritzburg (South Africa).
or primary bibliographic entry see Field 2B.
77-01365

HYDRO-ECONOMIC EVALUATION OF
ORESTRY IN THE EERSTE RIVER
ATCHMENT,
epartment of Forestry, Pretoria (South Africa).
or primary bibliographic entry see Field 4A.
77-01368

LLOCATION OF WATER TO FORESTRY
ND OTHER USERS IN THE CATCHMENT OF
HE EERSTE RIVER,
nkershoek Forest Research Station, Stellen-
sch (South Africa).
or primary bibliographic entry see Field 4D.
77-01385

STIMATING WATER YIELD DIFFERENCES
ETWEEN HARDWOOD AND PINE FORESTS:
N APPLICATION OF NET PRECIPITATION
ATA,
orest Service (USDA), Grand Rapids, Minn.
orth Central Forest Experiment Station.
S. Verry.
esearch Paper NC-128, 1976, 12 p, 3 fig, 8 tab, 20
f.

escriptors: *Forest watersheds, *Forest manage-
ent, Streamflow, Deciduous trees, *Water yield,
oniferous trees, Pine trees, Interception,
linnesota, *Precipitation(Atmospheric),
nowfall.
entifiers: *Aspen, *Red pine, *Black spruce,
orest conversions.

et rainstorm and net seasonal snowfall equations
rived from new studies and the literature are ap-
ed to aspen and red pine forests in north-central
nnesota to estimate net seasonal and annual
ecipitation. These equations provide the basis
making objective assessments of the impact of
rdwood-pine conversions on water yield. An ap-
ndix also includes net precipitation data for a
ck spruce forest. (Forest Service)
77-01425

AXIMUM PEAK FLOW FOR SELECTED
TURN PERIODS FOR WATERSHEDS WEST
THE CONTINENTAL DIVIDE IN IDAHO
D MONTANA,
rest Service (USDA), Ogden Utah. Intermoun-
n Forest and Range Experiment Station.
r primary bibliographic entry see Field 4D.
77-01435

SULTS OF THE MULTIPLE CATCHMENT
PERIMENTS AT THE JONKERSHOEK
SEARCH STATION, SOUTH AFRICA. 2. IN-
FLUENCE OF PROTECTION OF FYNBOS ON STREAM DISCHARGE IN LANGRIVIER,
Jonkershoek Forest Research Station, Stellenbosch (South Africa).
For primary bibliographic entry see Field 4D.
W77-01474

3C. Use Of Water Of Impaired Quality

WATER AND SALT DISTRIBUTION IN A SOIL UNDER TRICKLE IRRIGATION,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
M. C. S. Leao.
Ph.D. Dissertation, 1975, 14 fig, 14 tab, 30 ref.

Descriptors: *Leaching, *Irrigation systems, *Soil-water-plant-relationships, *Irrigation effects, Permeability, Lettuce, Soil water, Salts, *Salinity, *Salt tolerance.
Identifiers: *Trickle irrigation.

A field study was conducted to determine water and salt distribution patterns in soil irrigated by pairs of double-chamber, perforated polyethylene tubes in two experiments: a water distribution and salt distribution experiment. Moisture profiles are presented for the various water distribution tests. Water movement in the soil was two to three times greater in the horizontal than in the vertical direction. Wetted soil volume showed a high positive correlation with both volume of water applied and with time of application. Salt accumulation occurred mainly at the soil surface between the irrigation tubes and away from the main root zone of the plants. The surface accumulation was followed by a leached zone. There were no significant differences in yield among plots receiving different treatments. The study indicated that trickle irrigation with water of high salt content is likely to cause a high surface concentration of salts. Application of extra amounts of water by the trickle system, or another method, is recommended to leach the soils to a depth below the crop root zone. (Jamail-Arizona)
W77-01271

SOIL-WATER-PLANT RELATIONSHIPS - IMPORTANT DESIGN CRITERIA FOR IRRIGATION-PLANNING, (GROND-PLANT-WATER-VERHOUDINGS AS BELANGRIKE ONTWERP-GEGEWENS VIR BESPROEIING-SBEPLANNING),
Stellenbosch Univ. (South Africa). Dept. of Agriculture.
H. W. Weber.
Tegnikon, No. 2, p 2-10, (1975). 2 fig, 2 tab.

Descriptors: Irrigation design, Irrigation systems, Brackish water, Crop production, Dissolved solids, Soils, *Soil-water-plant relationships, Design criteria.
Identifiers: South Africa, Soil clogging.

In arid climates the production potential of irrigated soils is perpetually being menaced by decline and eventual destruction. The causes are mainly (i) the use of low quality waters having a high content of total dissolved solids, for irrigation and (ii) over-irrigation. Both causes are closely interconnected and either can originate the other. The exploitable water resources of Southern Africa will progressively be absorbed by the growing economy and expanding municipal areas. Therefore, less and less water will in future be allocated to an irrigation agriculture hitherto accustomed to luxury consumption endangering the soil. The irrigation farmer will have to produce the same or even higher harvests with less water in order to comply with the requirements of a responsible and rational water use and, simultaneously, to check the further decline of the quality of his soils. A basic knowledge about the interactions between soils, plants and water within any given set of climatic conditions is an indispensable necessity. In a simple, non-technical language some of the more important factors involved and their interdependency as well as their use for the design of irrigation projects are given. (South Africa)
W77-01454

3D. Conservation In Domestic and Municipal Use

SUGARLOAF CREEK PROJECT (AUSTRALIA): FLOOD STUDIES.
Melbourne and Metropolitan Board of Works (Australia). Water Supply Div.
For primary bibliographic entry see Field 8A.
W77-01067

FUTURE DIRECTION OF URBAN WATER MODELS,
Water Resources Engineers, Inc. Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W77-01071

A SUBURBAN MODEL OF RATIONAL GROUND WATER UTILIZATION: A PLAN FOR NASSAU COUNTY,
City Univ. of New York.
For primary bibliographic entry see Field 4B.
W77-01182

IDENTIFYING URBAN FLASH FLOODING PROBLEMS,
Washington Univ., St. Louis, Mo. Dept. of Technology and Human Affairs.
For primary bibliographic entry see Field 4A.
W77-01351

THE EFFECTS OF PRESSURE ON DOMESTIC WATER SUPPLY INCLUDING OBSERVATIONS ON THE EFFECT OF LIMITED GARDEN-WATERING RESTRICTIONS DURING A PERIOD OF HIGH DEMAND,
Johannesburg City Engineer's Dept. (South Africa).
D. S. Gebhardt.
Water SA., Vol 1(1), p 3-8, (1975). 6 fig, 2 tab, 1 ref.

Descriptors: *Domestic water, *Water demand, Water conservation, *Water utilization, Leakage, *Water pressure, *Water consumption, Water supply, Cities, Hydrostatic pressure.
Identifiers: South Africa, Johannesburg.

Water is precious in South Africa. Water engineers throughout the country are constantly considering ways of improving urban supply systems and of saving this rather scarce commodity. In Johannesburg one aspect of urban water conservation is receiving special attention, namely the effects of excessive pressure in reticulation systems on water wastage. The problem is to what extent such pressures contribute to the overall wastage of water and what steps could be taken to rectify the position. The author comes to the conclusion that changes in the pressure of supply have an immediate effect on consumption throughout the whole system. A rise of over 60% in pressure causes a 30% increase in consumption in a residential township. The results of leakage tests show that losses are proportional to pressure. (South Africa)
W77-01360

IMPROVED ANAEROBIC DIGESTION OF SOLID URBAN WASTE,
For primary bibliographic entry see Field 5D.
W77-01462

THE ENERGY POTENTIAL OF MUNICIPAL SOLID WASTES IN SOUTH AFRICA,
Stellenbosch Univ. (South Africa). Dept. of Chemical Engineering.
M. A. Connor.
The Civil Engineer in South Africa, Vol 17 (11), p 295-301, (1975). 7 tab, 26 ref.

Descriptors: *Solid wastes, Energy, Economics, Fuels, Pyrolisis, *Municipal wastes, Waste treatment, *Recycling.
Identifiers: South Africa, *Waste recovery.

Municipal solid wastes are currently receiving attention as potential minor sources of energy. Wastes can make a contribution of the overall energy situation in four ways: directly, by combustion of wastes to produce energy; indirectly, by conversion to gaseous, liquid or solid fuels; by returning to the economy materials manufactured by energy intensive processes; and by providing a feedstock for the manufacture of materials normally produced from key energy resources such as oil. The advantages, disadvantages and economics of different processes in each of the above categories are compared and related to the South African situation. It is concluded that, in the medium to long-term, municipal solid wastes can make a small but significant contribution to this country's energy supplies. (South Africa)
W77-01463

APPLICATION OF MUNICIPAL BY-LAWS WITH SPECIAL REFERENCE TO DRAINAGE REGULATIONS,
Johannesburg City Engineer's Dept. (South Africa).
For primary bibliographic entry see Field 4A.
W77-01485

EVALUATION REPORT: WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING. DAYTON DEVELOPMENT, PROJECT NO. 287, FOX RIVER, WISCONSIN AND ILLINOIS.
Federal Power Commission, Washington, D.C. Bureau of Power.
For primary bibliographic entry see Field 6F.
W77-01511

3E. Conservation In Industry

AN EXPLORATORY STUDY OF POSSIBLE ENERGY SAVINGS AS A RESULT OF WATER CONSERVATION PRACTICES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
G. W. Reid.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 490, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, July 1976. 135 p, 12 fig, 28 tab, 25 ref. OWRT A-061-OKLA(1).

Descriptors: *Water conservation, *Energy, *Cost analysis, Water reuse, Waste disposal, Recycling, *Alternative water use, *Alternative costs, Municipal water.
Identifiers: *Household water conservation alternatives, Savings in water, Savings in energy.

The objective is to evaluate energy consumption from the use of various alternatives of water conservation practices. The amount of water saved from each alternative is first calculated. Then, from each of these potential water savings, the amount of energy involved and the economical effect of each alternative can be determined. This study includes comparisons of eighty-one possible household water conservation devices and reuse systems with conventional water use methods and comparisons of flow reduction from residential uses as results of the alternatives. Total monetary savings in energy of each alternative, associated with pumping, heating, transmission and operation for water production and wastewater treatment are compared with the total monetary savings in water of the water-saving devices. A cost-effectiveness analysis and the ratings of the conservation alternatives in terms of both energy and water saved are presented.
W77-01052

COAL AND THE ENVIRONMENT, ABSTRACT SERIES, MINE DRAINAGE BIBLIOGRAPHY, 1910-1976.
Bituminous Coal Research, Inc., Monroeville, Pa.
For primary bibliographic entry see Field 5G.
W77-01192

WASTE WATER TREATMENT,
Swift and Co., Chicago, Ill. (Assignee).
For primary bibliographic entry see Field 5D.
W77-01217

CHROMIUM REMOVAL AND RECOVERY PROCESS,
Cunningham (John), Portsmouth, Ohio (Assignee).
For primary bibliographic entry see Field 5D.
W77-01220

AVAILABILITY OF WATER FOR COAL CONVERSION,
Bureau of Reclamation, Billings, Mont. Upper Missouri Region.
P. Q. Gibbs.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 219-225, November 1976. 2 fig, 2 tab.

Descriptors: *Water supply, *Coals, *Water pollution, Aqueducts, Energy, Water sources, River basins, Water allocation(Applied), Storage, Diversion, *Great Plains, Energy conversion.
Identifiers: *Water availability, Energy companies, *Coal conversion.

Coal is abundant in the Northern Great Plains. Other forms of energy from converting coal require water. Sources where substantial water supplies are available are limited, but there are some that could serve Montana, Wyoming, and North Dakota. Sources are primarily in Upper Missouri River Basin and tributaries. The Yellowstone River Compact allocates water between Montana and Wyoming on four interstate tributaries. Existing storage impoundments are preferred. Locations, capacities, and streamflow are shown. Possible routes and cost of water conveyance have been determined in studies by the Bureau of Reclamation. Energy companies hold options to some stored waters. Ground water from Madison Formation deep beneath the Fort Union-Powder Basin Coal Region is possible as an alternative water source. Federal and state cooperation is required to make developments possible, and developers are required to satisfy environmental statues. (Bell-Cornell)
W77-01345

WATER CONFLICTS IN WESTERN COAL DEVELOPMENT,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
T. T. Williams.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineering, Vol. 102, No. WR 2, p 327-339, November 1976. 4 fig, 6 tab, 10 ref.

Descriptors: *Coal mines, *Water resources, *Water allocation(Policy), *Land use, *Energy, Mining, Montana, North Dakota, Wyoming, Strip mines, Water utilization, Irrigation, Water rights.
Identifiers: *Water conflicts.

Coal development is increasing rapidly in the Northern Great Plains. Strip mining in the Montana, North Dakota, Wyoming Fort Union region may reach 977,000,000 tons per year by the year 2000. Water requirements for surface strip mining are negligible, but significant quantities are required for conversion processes. Using the fastest rate of production currently projected, a total of 800,400 acre-ft per year could be needed. This much water is available in the region, but the major conflicts which exist are: new storage reservoirs may be required to provide the water when needed; possible agricultural development may need all the water that can be made available; fish and wildlife needs, recreation uses, and environmental preservation may preclude development. (Bell-Cornell)
W77-01349

WATER AVAILABLE FOR ENERGY--UPPER COLORADO RIVER BASIN,
Utah State Engineer's Office, Salt Lake City.
D. C. Hansen.
Journal of the Water Resources Planning and Management Division, Vol. 102, No. WR2, Proceedings of the American Society of Civil Engineers, p 341-348, November 1976. 1 tab, 5 ref.

Descriptors: *Colorado River, *Water resources, *Water rights, *Energy, Water supply.
Identifiers: Regional planning.

The Upper Colorado River Basin has abundant deposits of fossil fuels and minerals, and numerous projects are in progress, planned or projected, to extract these resources. The first question that needs to be answered to make it possible for these projects to become reality is the availability of water. The Upper Colorado River Basin states are presently depleting 60% of the water apportioned to them under the Colorado River Compact of 1922. Of the 40% remaining it is difficult to specify the exact amount of water available for future development because of the uncertainty of the amount of water needed to satisfy the Indian water rights and the amount of water that has been committed to various projects by the Upper Colorado River Basin states. A joint effort between Federal, state, and Indian leaders is needed to make water available for energy development and to insure that all Indian water rights are satisfied. (Bell-Cornell)
W77-01350

POWER AND WATER FOR SOUTH WEST AFRICA,
South West Africa Water and Electricity Corp. (Pty) Ltd., Windhoek.
A. D. W. Wolmarans.
The Professional Engineer, Vol 4(4), p 5-1 (1975).

Descriptors: *Water supply, *Water demand, *Hydroelectric power, *Africa, Water resources development, Future planning(Projected), Electrical power industry, *Electrical power production.
Identifiers: *South West Africa, Southern Africa, Kunene River, Okavango River, Gove Dam, Caleuque Dam, Ruacana Falls, Ovambo.

A description is given of the background, origin, growth, present position and immediate future of the South West Africa Water and Electricity Corporation (Pty) Ltd. (SWAWEK) in its endeavour to stimulate the growth and development of the territory of South West Africa. The further development of the enormous potential of the Kunene River and in addition, the development of the potential of the Okavango River not only for the generatio of electrical power but also for the supply of water, will expand the infrastructure necessary for the future development of the territory of S.W.A. (South Africa)
W77-01382

SCOM PIONEERS DRY COOLING,
J. Sheer.
onstruction in Southern Africa, Vol. 20(2), p 35-
, (1975).

escriptors: *Thermal powerplants, Water quirements, Water conservation, *Cooling wers, Design, Operations.
entifiers: *South Africa, *Transvaal, *Dry cool-g.

description is presented of the design and opera-on of the South African Electricity Supply Com-ssion's (ESCOM) dry-cooling tower system for 200 megawatt turbo-generator set at Grootvlei wer Station in Transvaal. This type of cooling stem, which is still in the prototype stage in veral countries, has a promising future in both ssil-fuelled and nuclear power stations. The com dry-cooling tower is presently the largest erating dry tower in the world, dissipating heat the atmosphere at a rate of 330 megawatts. A scription is presented the influence of various nospheric conditions on the performance of the wer, mention is made that no significant corro-on of the heat exchanger has occurred and that erating staff have not encountered any control maintenance difficulties. (South Africa)
77-01467

IE COOLING WATER EQUATION,
r primary bibliographic entry see Field 6D.
77-01468

UENCHING SALDANHA'S THIRST.
ldanha-Sishen Progress Report, Suppl. Con-uction in S.A. and Coal, Gold and Base nerals of Southern Africa, January 1975, p 53-

escriptors: *Water requirements, *Water supply velopment, Costs, Future planning(Projected), n and steel industry, Water utilization, ndustrial water, Bays, *Water demand, Potable ter, *Estimated costs.
entifiers: *Saldanha Bay, *South Africa, Berg ver, Voelvlei Dam.

s pointed out that the massive development un-rway at Saldanha Bay has made it imperative t water supply to the area be improved. To this d the South African Department of Water Af-rs is embarking on an amitious water project ich will aim at supplying the area with over 100) m3/day of fully potable water by 1977/78. It is imated that the cost of the scheme will be in the ion of R42-million. Estimated water require-nts for domestic purposes, the operation of iron and harbour facilities, steel production and neral industries are tabulated up to the year 00. (South Africa)
77-01473

NTROL OF WATER POLLUTION - A HID-N RESOURCE, (BEHEER OOR WATER-SOEDELING - 'N VERBORGE HULPBRON),
partment of Water Affairs, Pretoria (South rica).
r primary bibliographic entry see Field 5G.
7-01489

. Conservation In Agriculture

E IMPACT OF INCREASED ENERGY STS ON WATER USE AND AGRICULTURAL TPUT IN NORTHWESTERN OKLAHOMA,
lahoma State Univ., Stillwater. Dept. of ricultural Economics.
P. Mapp, Jr, and V. R. Eidman.
ailable from the National Technical Informa-n Service, Springfield, VA 22161 as PB-260 487, ce codes: A05 in paper copy, A01 in microfiche. mpletion Report, September 1976. 95 p, 9 fig, 27 tab, 28 ref. OWRT A-057-Okla(2), 14-34-0001-6037.

Descriptors: Irrigation, Energy, Surface-groundwater relationships, *Economics, *Farm management, *Irrigation systems, *Irrigation efficiency, Drawdown, Aquifers, *Deep-well pumping, Overdraft, Water table, *Cultivation, Zone of saturation, Fuels, Economic impact, Costs, Farm prices. Identifiers: Reduced tillage, Natural gas, *Energy conservation, Fossil fuels.

This study was designed to (1) identify production practices which reduce tillage operations, resulting in reduced fossil fuel energy use and increased net returns, (2) determine optimum organizations of production for representative farms maximizing net returns and maximizing net kilocalories of output, and (3) evaluate the impact of rising natural gas prices on optimum organizations of production for farms in alternative resource situations under low and high crop prices. Reduced tillage methods increase both net returns and net kilocalories of output. Organizations of production obtained when maximizing net kilocalories of output require more fossil fuel inputs per farm, result in a shift to crops that utilize the forage as well as the grain produced and lead to negative net returns. Rising natural gas prices have several potential effects. First, they increase the cost of pumping and, other things equal, reduce the level of net returns associated with irrigated crop production. Second, shifts from high to moderate levels of irrigation occur under constant and increasing natural gas prices due to changes in the water table and pumping costs over time. Third, rising natural gas prices result in a more rapid return to dryland farming and a two-thirds reduction in net returns.
W77-01056

MODEL WATER RESOURCES PROGRAM,
For primary bibliographic entry see Field 6E.
W77-01079

DRIP IRRIGATION: ISRAEL TEACHES CALIFORNIA,
A. Marquis.
The Nation, Vol 220, p 403-4, April 5, 1975. 2 p.

Descriptors: *Water distribution(Applied), *Foreign countries, *Water yield improvement, *Irrigation design, *Irrigation efficiency, Irrigation systems, Irrigation engineering, Crop response, Drainage effects, Farm management, Irrigated land, Water control, Distribution systems, Sprinkler irrigation, Furrow irrigation, California. Identifiers: *Drip irrigation, Israel.

Drip irrigation, with its many benefits and few liabilities, seems to be the agricultural wave of the future. The basic idea, evolved over the past 15 years, is to dribble water at the rate of about a gallon per hour directly to the plant roots, rather than spray as much as 60 gallons per hour into the air or channel streams into furrows where perhaps half is lost to evaporation. Among the benefits are: (1) brackish water can be used in a drip system; (2) secondary effluent from a sewage treatment plant can be used; (3) plums and oranges will flourish on half the water; (4) land that was either too rocky or too steep can now be brought under cultivation; (5) costs drop dramatically; and (6) fertilizer can be added to the water. The major problem is the clogging of dispersal heads, but this is being worked out with the help of better filters. Prospects for use in developed countries are excellent; however, where labor is cheaper than the cost of introduction of this system ($600 per acre), the switch to drip irrigation is a long way off. (Frank-Florida)
W77-01080

NON-SIDE-SPLASH WATER SPRINKLERS,
M. Drori.
U.S. Patent No. 3,966,122, 7 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2093, June 29, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficienty, Distribution systems, Water distribution(Applied), Application equipment.

The object of the invention is to provide a new arrangement for preventing or reducing side-splash in water sprinklers. The non-side-splash feature can be applied to various standard sprinkler head constructions, requiring merely a simple and inexpensive modification to adapt them for the non-side-splash function. The sprinkler includes a splash guard carried by the sprinkler head at a location to be impinged by the water splashed laterally from the drive member to substantially block side-splash. Also the rotational axis of the sprinkler head is substantially aligned with the general vicinity of impingement of the water splashed against the splash-guard such that little or no rotary torque is applied to the sprinkler head. (Sinha-OEIS)
W77-01197

RATING OF IRRIGATED SOILS OF THE SAL'YAN REGION, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W77-01208

DRIP IRRIGATION DEVICE,
R. L. Hendrickson.
U. S. Patent No. 3,968,930, 4 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 948, No 2, p 557, July 13, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, *Flow control, *Flow restriction water, Distribution(Applied), Application equipment, Water control.
Identifiers: *Drip irrigation.

A flow restrictor fitting for use in drip irrigation can be connected between two lengths of hose and when used in series with a number of lengths of hose provides means for irrigating areas by emitting small drips at each of the fittings to minimize waste of water. The central core member has a portion adjacent one end that is enlarged in outer diameter. This enlarged portion has a helical rib or thread defined on the outer surface and adjacent one end has an opening from the central passageway to the outer surface having the helical rib. A shell or cover member is threadably mounted onto the central core member and has a generally cylindrical inner surface that surrounds the helical rib and provides an enclosed helical flow restriction channel or passage. An opening is provided from the through passage of the core member to the helical rib so that water can flow in the recesses between the ribs along the length of the helix so that only a small, controlled drip of water will be emitted. The device is manufactured from plastic materials. (Sinha-OEIS)
W77-01213

PIPE-FOLLOWING IRRIGATION MACHINE,
Wright Rain Ltd., Ringwood (England). (Assignee).
V. B. W. Harvey.
U.S. Patent No. 3,970,102, 15 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 948, No 3, p 953, July 20, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Conveyance structures, Water conveyance, Automatic control.

An irrigation machine has traction wheels which run along the top of a pipe having self-closing hydrants spaced apart in the length of the pipe. The machine is guided to follow the course of the

pipe. When the machine reaches a hydrant, the machine stops and a vertically-movable riser pipe in the form of a probe and connected to a water gun or other water distribution device automtically descends to open the hydrant valve and thus admit water to the riser pipe and to the water gun. The machine is fitted with a device which shifts the machine longitudinally of the hydrant as the riser pipe is lowered towards the hydrant so that when the probe end of the riser pipe enters the hydrant, the probe end will be in precise vertical alignment with the hydrant. After a predetermined time the riser pipe is raised, the hydrant valve closes and the machine travels along the pipe to the next hydrant. (Sinha-OEIS)
W77-01224

PIPE INSERTABLE EMITTER FOR IRRIGATION SYSTEMS,
Harmony Emitter Co., Inc., Tucson. Ariz. (Assignee).
R. C. Harmony.
U.S. Patent No. 3,970,251, 5 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 948, No 3, p 1005, July 20, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, *Flow control, Water distribution(Applied), Application equipment, Erosion.
Identifiers: Emitters.

An emitter is provided which delivers a constant flow of water despite variations in the water pressure. A number of emitters are inserted along a water distribution line, each of which are self regulating to provide a constant water discharge rate regardless of the location along the line. The emitters can be replaced and require no adjustment to control the rate of water flow. They are usable with irrigation water having suspended particulate matter. The emitter is formed of the following elements: a base for conveying water from within the water distribution line and having a depending hollow shroud for penetrating the wall of the water distribution line; an apertured diaphragm mounted on the base for establishing a water discharge outlet; bias means for maintaining a constant rate of water and comprising a pair of opposed surfaces separable from one another for defining a single passageway for the water flow; and a cap for securing the diaphragm to the base. (Sinha-OEIS)
W77-01225

SOIL NITRATE LOSS DURING IRRIGATION: ENHANCEMENT BY PLANT ROOTS,
California Univ., Berkeley, Coll. of Natural Resources.
M. G. Volz, M. S. Ardakani, R. K. Schulz, L. H. Stolzy, and A. D. McLaren.
Agronomy Journal, Vol. 68, No. 4, p 621-627, July-August 1976. 6 fig, 1 tab, 31 ref.

Descriptors: *Nitrates, *Denitrification, *Irrigation effects, *Root systems, *Soil-water-plant relationships, Nitrogen, Nitrites, Absorption, Organic matter, Soil analysis, Soil microorganisms, Bacteria.

The effects of a root system on nitrate loss from soil solution during irrigation of two Hanford sandy loam plots, one fallow and the other planted with barley (Hordeum vulgare), are reported. Plots were ponded for 44 hours with a solution containing 100 ppm N and 46 ppm C1- (tracer for NO-3) as KNO3 and CaC12, respectively. Nitrate-nitrogen concentrations during irrigation were lower in most soil solution samples from 0 to 60 cm under barley than in those from fallow plosts, but C1-concentration profiles were the same to a depth of 45 cm. During the later irrigation period, nitrate losses due to microbial use of NO-3 under barley were almost 90% of the total. This is probably due to stimulation of dissimilatory nitrate and nitrate reduction by both organic C exuded from barley and a decreased soil redox potential. (Jahns-Arizona)
W77-01268

SETTLEMENTS IN THE RAJASTHAN CANAL IRRIGATION AREA, INDIA,
For primary bibliographic entry see Field 4C.
W77-01272

ENERGY SOURCES FOR IRRIGATION PUMPS IN NORTHWESTERN NEW SOUTH WALES,
University of New England, Armidale (Australia). Dept. of Geography.
J. J. J. Pigram.
Australian Geographical Studies, Vol. 13, No. 1, p. 85-93, April, 1975. 3 fig, 4 ref.

Descriptors: *Irrigation efficiency, *Irrigation operation and maintenance, *Pumping, *Natural gas, Fuels, Maintenance costs, Electric power costs, *Australia, Irrigation systems, Arid lands.
Identifiers: Diesel power, *New South Wales.

Since only nominal charges are levied for irrigation water in northwestern New South Wales, the major expense incurred in irrigation is the cost of pumping. The use of diesel fuels, electric power or natural gas is evaluated. Diesel has been preferred because it was more readily available. Although the cost of fuel for a diesel engine may be considerably less than the cost of electricity for a motor developing the same horsepower, a true comparison of operating costs should take into account lubrication requirements, maintenance, and interest and depreciation, among other factors. While electricity is gaining on diesel power for use in irrigation pumping, a new source of power, natural gas, has been discovered in commercial quantities in Australia and should prove to be an ideal source for irrigation pumping. (Jamail-Arizona)
W77-01274

LEAF WATER POTENTIAL AND STOMATAL ACTIVITY IN SORGHUM AS INFLUENCED BY SOIL MOISTURE STRESS,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 2I.
W77-01276

A NOTE ON THE USE OF BENTONITE CLAY AS A SUB-SOIL MOISTURE BARRIER FOR VEGETABLE PRODUCTION ON DRYLANDS OF RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
R. P. Singh, H. P. Singh, and K. C. Singh.
Annals of Arid Zone, Vol 14, No 1, p 63-66, 1975. 2 tab.

Descriptors: *Crop response, *Bentonite, *Vegetable crops, Percolation, *Clays, Crops, Sands, Moisture content, Water utilization, Soil profiles, Soil moisture, Soil types, Soil water, Return(Monetary).
Identifiers: *Rajasthan, *India.

Experiments were conducted on several vegetable crops to test the efficacy of bentonite clay in reducing deep percolation losses and increasing vegetable yields on the drylands of Rajasthan. Vegetable growers generally dig pits to prepare localized seed beds for planting Cucurbits. Pits of 30-35 centimeters in diameter were dug on sandy loam soil, and bentonite and FYM incorporated at different depths. Pits having the bentonite barrier exhibited higher moisture content at harvest and greater yield than the controls in the case of all vegetable crops tried. In the case of kakri, the yield differences show an interesting trend in that the vegetable yield increases with the depth of incorporation of the amendments. Use of bentonite results in substantial cost savings. (Jamail-Arizona)
W77-01277

RESPONSE OF WHEAT UNDER SUB-HUMI IRRIGATED CONDITIONS TO ATMOSPHERI MISTING DURING GRAIN FILLING,
International Maize and Wheat Improvement Ce tre, Londres (Mexico).
D. R. Laing, and R. A. Fischer.
Agricultural Meteorology, Vol. 15, p 285-29 1975. 4 fig, 2 tab, 9 ref.

Descriptors: *Mist irrigation, *Wheat, *Cr response, *Sub-humid climates, *Plant growth, rigation, Cereal crops, Grains(Crops), Cr production, Xylem, Water storage, Leaves, St mata, Moisture stress, Soil water, Growth rat Moisture content, Thermal stress.

Atmospherically-induced plant water defi and/or high temperature effects have been post lated as possible limitations to grain yield in rigated sub-humid environments. An experime was conducted in northwest Mexico to test t hypothesis, using a high yielding dwarf variety wheat grown under intensive irrigation. Misti during grain filling was automatically activated ear temperatures above 25 degrees centigra Leaf relative water content and xylem wa potential for the control and misted areas we measured. Stomatal resistance measurements dicated no difference between the two treatme throughout a diurnal cycle. Grain growth rate w slower in the misted treatment, apparently a result of lower ear temperature. Treatments h no effect on final grain size and yield. Atmosphe cally-induced stress did not appear to limit gr yield under the meteorological conditions perienced during this experiment. (Jam Arizona)
W77-01284

SULFURIC ACID FOR THE TREATMENT AMMONIATED IRRIGATION WATER: REDUCING CALCIUM PRECIPITATION A SODIUM HAZARD,
New Mexico State Univ., Las Cruces. Dept. Agronomy.
For primary bibliographic entry see Field 5G.
W77-01286

R10 MILLION WATER SCHEME NEA COMPLETION, IRRIGATING THE ISLAN OF THE ORANGE.
Construction in Southern Africa, Vol 19 (10), p 65, (1975).

Descriptors: *Irrigation design, Islan Economics, *Irrigation canals, Crop productio
Identifiers: *South Africa, *Orange River Africa).

The South African Department of Water Aff seeked approval for an additional R1,3-millio complete the Uppington Islands Water Sche When the scheme was proposed in 1966 the t cost was put at R9,2-million. Since then the c have risen considerably and the Department Water Affairs needs the money to complete m portions of the scheme. Basically, the project vides for the betterment and extension of a gr of irrigation schemes along the Orange River in vicinity of Uppington. (South Africa)
W77-01375

OPTIMUM UTILISATION OF WATER,
Department of Agricultural Technical Servi Stellenbosch (South Africa). Winter Rainfall gion.
A. F. Kriel.
The Deciduous Fruit Grower, Vol. 25 (1), p 20 (1975).

Descriptors: *Irrigation design, *Irrigation ciency, Water conservation, Water consumpt Soil-water-plant relationships, Soil moisture tent, Soil hydraulic characteristics, *Irriga water, Optimization.
Identifiers: *South Africa, Western Cape.

the intensive agricultural regions of the public of South Africa, the rainfall is seldom h enough to ensure optimum production thout supplementing the natural rainfall. Soil, ter and plants are inseparable in the production ocess. Irrigation water is valuable and as such it uld be applied and used optimally in order to ke optimum use of the soil. To date the empha- has been on water conservation, but in future it l be necessary to give more attention to op- um utilisation of the available water. There is a le range of factors affecting the use of water l these should be taken into consideration in nning irrigation practices. These factors include physical nature of the soil, the quality and ce of the water, the prevailing climate, the crop ncerned with its needs and the distribution tem. (South Africa)
7-01383

RTI-IRRIGATION - APPLICATION OF FER- LISER MATERIALS BY MEANS OF MICRO- RIGATION SYSTEMS - PART 1,
llenbosch Univ. (South Africa). Dept. of Soil ence.
F. Greeff.
e Deciduous Fruit Grower, Vol 25 (8), p 213- , (1975). 3 fig, 2 tab, 3 ref.

scriptors: *Fertilizers, *Irrigation, Soil water vement, Agriculture, Crop production, trients, *Irrigation systems, Fertilization. ntifiers: South Africa, *Ferti-irrigation, licro-irrigation systems.

rti-irrigation, simultaneous irrigation and fer- sation in local orchards and vineyards, has been de possible by the installation of permanent cro-irrigation systems and the availability of h-grade, completely water-soluble fertiliser terials. Ferti-irrigation, as a standard orchard ctice, is becoming more popular. Most produ- s allow for incorporation of a permanent or rtable fertiliser tank at the control centre of ch irrigation block. Ferti-irrigation offers the oducer the following advantages over conven- nal fertilisation practices: Localised placement plant nutrients, movement of applied nutrients o the root zone, labour saving, and continuous pply of the required plant nutrients during the wth season. However, this technique can only utilised economically and effectively when naged correctly. This report aims to illustrate advantage gained from, and pitfalls ex- ienced with, local ferti-irrigation. (See also 7-01394) (South Africa)
7-01393

RTI-IRRIGATION-APPLICATION OF FER- LISER MATERIALS BY MEANS OF MICRO- RIGATION SYSTEMS - PART 2,
llenbosch Univ. (South Africa). Dept. of Soil ence.
F. Greeff.
e Deciduous Fruit Grower, Vol 25 (9), p 240- , (1975). 5 fig, 4 tab, 7 ref.

scriptors: *Fertilizers, *Irrigation, Soil water vement, Operation and maintenance, Agricul- e, Crop production, Nutrients, Fertilization, rigation systems.
ntifiers: South Africa, *Ferti-irrigation, Micro- gation systems.

rti-irrigation, simultaneous irrigation and fer- sation, is common practice in orchards and eyards irrigated by means of micro-irrigation tems. In Part 1 of this paper the requirements successful ferti-irrigation with regard to appli- ion of the fertiliser material, soluble fertiliser terials and ferti-irrigation timing were cussed. In this Part the quality of fertiliser to be plied, movement of the applied nutrients in the l and effective system maintenance will be cussed. (See also W77-01393) (South Africa)
7-01394

LEAF ANALYSIS PROVES USEFUL IN IN- CREASING EFFICIENCY OF NITROGEN FER- TILIZATION OF ORANGES AND REDUCING NITRATE POLLUTION POTENTIAL,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5G.
W77-01434

DISCHARGE CHARACTERISTICS OF SPACED SLITS IN POLYETHELENE PIPES UNDER PULSATING PRESSURE CONDITIONS,
Pretoria Univ. (South Africa). Dept. of Agricultural Engineering.
D. S. van der Merwe, and B. J. Grobler.
Water S A., Vol 1 (3), p 102-108, (1975). 10 fig, 1 tab, 2 ref.

Descriptors: *Plastic pipes, *Drip irrigation, Pressure conduits, *Discharge measurement, Pressure head, Temperature, Water temperature.
Identifiers: South Africa.

Slits in a polyethelene pipe, under pulsating pressure conditions, were investigated as a possible dripper for drip irrigation. A prerequisite for the practical implementation of slits is that cutting of the slits should be as simple as possible. An apparatus for cutting the slits was designed and tested. It appeared that the discharge from a slit under pulsating pressure conditions is mainly influenced by the pressure head during the discharge period, the duration of the discharge period, and the pulsation rate. There were indications that the temperature of the water has an important effect on the discharge, the extent of which will have to be determined. The effect of slit orientation on the discharge characteristics was also investigated. Three orientations were used, and it was clear that slits parallel to the longitudinal axis of the pipe was the only orientation suitable for practical use. (South Africa)
W77-01443

SYSTEM ANALYSIS: SPRINKLER SPACING, (SISTEEMANALISE: SPRINKELAAR-SPASIER- ING),
South Africa Dept. of Agricultural Technical Services, Pretoria.
J. N. de Bruyn.
Agriculture-Engineering in South Africa, Vol 9 (1), p 45-57, (1975). 2 fig, 1 tab.

Descriptors: Systems analysis, Computer models, Irrigation design, Spray irrigation, Sprinklers, Agricultural engineering, Model studies.
Identifiers: South Africa.

System analysis is not a new idea, but computer facilities have made it more applicable in agriculture. The main aim is to define system analysis in agricultural engineering. A practical example is given of a sprinkler spacing model. The model, except for saving labour during the official sprinkler distribution tests, can also be used for the design of sprinkler irrigation systems and the design of fire extinguishing systems in buildings using water sprinklers. (South Africa)
W77-01453

PRECIPITATION OF CALCIUM AND STRON- TIUM SULFATES AROUND PLANT ROOTS AND ITS EVALUATION,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 2I.
W77-01514

AMMONIA VOLATILIZATION FROM SUR- FACE APPLICATIONS OF AMMONIUM COM- POUNDS ON CALCAREOUS SOILS: IV. EF- FECT OF CALCIUM CARBONATE CONTENT,
Texas A and M Univ., El Paso. Agricultureal Research Station.
For primary bibliographic entry see Field 2G.
W77-01515

CONVENTIONAL AND CONTROLLED- RELEASE NITROGEN SOURCES FOR RICE,
Arkansas Agricultural Experiment Station, Stuttgart. Rice Branch Experiment Station.
B. R. Wells, and P. A. Shockley.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 549-551, May-June 1975. 3 tab, 8 ref.

Descriptors: *Soils, *Fertilizers, *Fertilization, *Ureas, *Nitrogen, *Rice, Crop production, Crop response, Water pollution sources, Absorption, Path of pollutants.

Tests were conducted for the years 1967-1972 with rice to compare various formulations of sulfur-coated urea (SCU) and iso-butylidene diurea, (I.B.D.U.) with urea and ammonium sulfate as nitrogen sources on both silt loam and clay soils. The N sources were applied either preplant or top-dress at rates up to 235 kg/ha to drill-seeded rice which was flooded at approximately 2 weeks following seedling emergence. Grain yields, dry weight, and N uptake indicated that the controlled-release N sources could be used to regulate rate of N supply to the plant throughout the growing season. Growth of direct seeded rice was slowed considerably during the early part of the growing season due to the slow rate of N release but grain yields were not drastically altered. Grain yields on the silt loam soils following use of the controlled-release N fertilizers were consistently equal to those following use of urea or ammonium sulfate. On the clay soils under intermittent flooding, use of SCU resulted in increased yields as compared to urea applied preplant, and in one year resulted in increased yields as compared to urea applied in split topdress doses. Both SCU and I.B.D.U. were suitable N sources for rice growing under the water management systems employed in these studies. (Skogerboe-Colo St)
W77-01516

SULFURIC ACID FOR THE TREATMENT OF AMMONIATED IRRIGATION WATER: I. REDUCING AMMONIA VOLATILIZATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5G.
W77-01517

PROSPECTS OF HYDROMETRY IN THE LIGHT OF MODERN TECHNOLOGY,
International Commission on Irrigation and Drainage, New Delhi (India).
For primary bibliographic entry see Field 7B.
W77-01519

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

RESEARCH TO DEVELOP ECOLOGICAL STANDARDS FOR WATER RESOURCES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6G.
W77-01054

A COARSE SORT SYSTEM FOR PRELIMINA- RY WATER RESOURCES MANAGEMENT AL- TERNATIVES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6A.
W77-01055

SUGARLOAF CREEK PROJECT (AUSTRALIA): FLOOD STUDIES.
Melbourne and Metropolitan Board of Works (Australia). Water Supply Div.
For primary bibliographic entry see Field 8A.
W77-01067

A REVISED REGIONAL FREQUENCY CURVE FOR THE YARRA CATCHMENT ABOVE WARRANDYTE (AUSTRALIA).
Melbourne and Metropolitan Board of Works (Australia), Water supply, Sewerage and Drainage Branch.
Report No. MMBW-W-0052, October 1975. 9 p., 10 fig., 6 tables, 5 ref. Kesari, N., and Panagiotopoulos, P. (comp.).

Descriptors: *Design flood, *Flood recurrence interval, *Frequency curves, *Australia, Flood flow, Control structures, Design data, *Flood forecasting.
Identifiers: *Yarra River(Vic).

In cases where there are no streamflow data available at or in the vicinity of a proposed water control structure, the magnitude of a flood of predetermined recurrence interval derived from a regional frequency curve may be used for design purposes. For the Yarra catchment (Victoria, Australia) such a regional curve was derived in 1969; a revised curve is presented using additional data to 1973, and with some alterations in method. The methods and data used in the revision are described in detail. (CSIRO)
W77-01068

THE MERRI CREEK FLOOD, 15-16 MAY 1974; CITIES OF NORTHCOTE BRUNSWICK (AUSTRALIA),
Melbourne and Metropolitan Board of Works (Australia). Main Drainage Div.
For primary bibliographic entry see Field 2E.
W77-01069

WATER SUPPLY CATCHMENT HYDROLOGY RESEARCH: THE WALLABY CREEK FOG DRIP STUDY,
Melbourne and Metropolitan Board of Works (Australia). Hydrological studies Section.
For primary bibliographic entry see Field 2I.
W77-01070

OWNERSHIP ON NAVIGABLE WATERBOTTOMS--CALIFORNIA COMPANY V PRICE REVISITED,
For primary bibliographic entry see Field 6E.
W77-01078

MODEL WATER RESOURCES PROGRAM,
For primary bibliographic entry see Field 6E.
W77-01079

CAUGHT IN MID-STREAM: ARMY CORPS OF ENGINEERS,
For primary bibliographic entry see Field 6E.
W77-01086

SHORELAND REGULATION IN WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6E.
W77-01087

PUBLIC RIGHTS TO ARTIFICIAL WATERBODIES IN FLORIDA,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01088

UNITED STATES STEEL CORPORATION V SAVE SAND KEY, INC.: A LOSING BATTLE IN THE FIGHT FOR FLORIDA BEACHES,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01089

THE DEVELOPMENT AND IMPLEMENTATION OF THE COASTAL CONSTRUCTION SETBACK LINE LAW,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01090

DRAWING THE LINE AT THE OCEANFRONT, THE ROLE OF COASTAL CONSTRUCTION SET-BACK LINES IN REGULATING DEVELOPMENT OF FLORIDA'S COASTAL ZONE,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01097

COMPRESSION OF TIME-SERIES DATA,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 7C.
W77-01132

A CLIMATONOMIC STUDY OF THE LAKE ONTARIO DRAINAGE BASIN,
California Univ., Berkeley, Dept. of Geography.
For primary bibliographic entry see Field 2H.
W77-01146

THE MEASUREMENT OF WATER LOSSES FROM A FORESTED AREA USING A 'NATURAL' LYSIMETER,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2D.
W77-01148

COMPARISON OF CHUTE AND STILLING BASIN PERFORMANCE FOR THREE DIFFERENT DROP BOX INLETS,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
For primary bibliographic entry see Field 8B.
W77-01151

HISTORY AND DEVELOPMENT OF MULTIPLE OBJECTIVE PLANNING FOR WATER RESOURCES,
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-01152

THE ATTITUDE AND INTEREST OF THE ENVIRONMENTAL PROTECTION AGENCY IN MULTIPLE OBJECTIVE PLANNING OF WATER AND RELATED LAND RESOURCES,
Environmental Protection Agency, Washington, D.C. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W77-01153

EMERGING CORPS OF ENGINEERS GUIDELINES FOR IMPLEMENTING THE PLANNING REQUIREMENTS OF WRC'S PRINCIPLES AND STANDARDS AND RELATED POLICIES,
Corps of Engineers, Washington, D.C. Planning Div.
For primary bibliographic entry see Field 6B.
W77-01154

IMPLEMENTATION OF MULTIPLE OBJECTIVE PLANNING BY THE SOIL CONSERVATION SERVICE,
Soil Conservation Service, Washington, D.C. River Basin.
For primary bibliographic entry see Field 6B.
W77-01155

PHILOSOPHY OF MULTIPLE OBJECTIVE PLANNING IN THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-01156

THE TENNESSEE VALLEY AUTHORITY AND MULTIPLE OBJECTIVE PLANNING,
Tennessee Valley Authority, Norris. Div. of Water Control Planning.
For primary bibliographic entry see Field 6B.
W77-01157

THE USE OF MULTIPLE OBJECTIVE PLANNING IN THE BUREAU OF LAND MANAGEMENT,
Bureau of Land Management, Denver, Colo.
For primary bibliographic entry see Field 6B.
W77-01161

DEVELOPING OPTIMAL OPERATING RULES FOR FLOOD PROTECTION RESERVOIRS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
G. A. Schultz, and E. J. Plate.
Journal of Hydrology, Vol. 28, No. 2/4, February 1976. p 245-264. 10 fig, 2 tab, 5 ref.

Descriptors: *Flood control, *Reservoir releases, *River systems, *Dynamic programming, *Analog computers, Optimization, Decision making, Algorithms, Equations, Systems analysis, Mathematical models.
Identifiers: *Operating rules, *Danube River(W Germany).

During recent decades, a considerable increase o flood damage costs has been observed in variou Central European countries, due mainly to th faster growth than the average population densit of the larger cities and industrials districts alon the main streams. The only means of reducin flood damage is by constructing flood protectio reservoirs in the upper reaches of the rivers. It i vital to utilize the limited retention space most ef ficiently, to be accomplished through controlle reservoir releases to minimize overall catchmen flood damage. This optimization problem is con sidered herein using a real world example on th Danube River. Examined are two different ap proaches to the problem: (1) development of nea optimum reservoir release strategies which wi lead to acceptable results without havin forecasts, utilizing an electrical analog computer and (2) development of optimum release strategie applicable for each single storm event using th dynamic programming method on a digital com puter. For the special system and flood under con sideration, parallel reservoirs are shown to be suit its purpose. (Bell-Cornell)
W77-01174

PUMPING POLICIES IN WATER SUPPLY,
Water Research Association, Marlow (England).
R. P. Donachie, K. Howard, P. A. Mawer, and T. Wyatt.
Journal of Hydrology, Vol. 28, No. 2/4, p 359-37 February 1976. (Published in Amsterdam) 5 fig, tab, 4 ref.

Descriptors: *Water supply, *Pumpin *Operating costs, *Optimization, *Schedulin Stochastics processes, Dynamic programmin Resource allocation, Water distribution(Applied

ervoirs, Constraints, Regression analysis, ar programming, Systems analysis, Mathecal models.
tifiers: *Cost minimization, Gradient search od, Mixed-integer programming, Control , Electricity tariffs, United Kingdom.

rge part of total operating expenses in water ly is attributable to pumping, thus providing a g incentive for the optimization of pumping dules. The need for optimal pumping dules arises in systems of widely different acteristics. This paper considers three comly occurring system types: resource systems r stochastic inputs; resource allocation to iple demand areas; and distribution systems. n of these system types calls for different solumethods. The paper emphasizes the imance of adequately modeling all significant res of the real system whilst at the same time ning acceptable computing costs. For the first m type, dynamic programming and the ient search method are both found to derive -cost control rules under which the system behave according to preset long term objec. The second system can be optimized utilizixed-integer programming. Finally, the third m problem is solved by using regression anal and a hill-climbing technique to reduce the mum demand for electricity at each pumping n. (Bell-Cornell)
-01177

OMPUTER-BASED TELECONTROL AND MUNICATION SYSTEM FOR A WATER PLY NETWORK,
Worcestershire Waterworks Co., Brome (England).
. Burch, and K. C. Marlow.
nal of Hydrology, Vol. 28, No. 2/4, p 407-427, uary 1976. 3 fig.

riptors: *Water supply, *Networks, omatic control, *Computers, Pumping, nmunication, Telemetry.
tifiers: England, *Telecontrol, Radio survey, smission equipment, Outstations.

East Worcestershire Waterworks Company lies water to a population of 200,000 over an of 300 square miles in the county of Worrshire, England. The 96-year old company een working on a scheme of modernization of ce works for the past 13 years. Existing diesel ns have been converted to electrical operaand automatic control equipment installed at umping stations. This article reports on the pany's resulting development of a centralized toring and control system for its expanding nsions. Considered are: the planning stage; ce works equipment, including automatic ing control schemes; conversions; telemetry fication; communication links; radio survey; mission equipment; speech communication; telecontrol system; outstations; standby r; master station and control center; diesel altor load-shedding; consumption trends; intion and commissioning; and subsequent ation. Although there is a greater degree of when using a centralized control scheme as sed to the traditional method, the significant can be minimized. The scheme is economiviable. (Bell-Cornell)
01179

RIDA'S SYSTEM FOR REGULATION OF ER USE--A MODERN INSTRUMENT FOR ND WATER RESOURCE MANAGEMENT,
da Univ., Gainesville. Coll. of Law.
rimary bibliographic entry see Field 6E.
01186

GRESS IN THE EXPLORATION AND IN SCIENTIFIC RESEARCH OF THE LIBYAN ERT SINCE GERHARD ROHLFS,
gart Univ. (West Germany).
W. Meckelein.
Annals of the Geological Survey of Egypt, Vol. 5, p 47-60, 1975. 1 fig, 88 ref.

Descriptors: *Deserts, *Africa, *Exploration, *Land reclamation, *History, *Water resources development, Topography, Arid climates, Geologic investigations, Groundwater, Cultivation, Land use.
Identifiers: *Libyan Desert, Gerhard Rohlfs, Oases.

A history is presented of exploration of the Libyan Desert, especially since the Gerhard Rohlfs expeditions of 1873-74, and the scientific data collected by such exploration. The progress of cartography, history of climate, geomorphology and groundwater research pertaining to this region are discussed. Land reclamation has been carried out in the northern and northeastern border zones of the desert, such as the Siwa oasis and near the western Nile delta. Cultivation has been successful, and the desert landscape has been changed by new settlements and roads. However, the output and pressure of wells has declined, and pumping is increasingly necessary. Other problems are increasing salinity, often in the best soils, and moving sands which threaten fields and road traffic. Also discussed are possible projects for agrarian land use and/or industrialization given economic and environmental limitations. (Jahns-Arizona)
W77-01269

ENERGY FOR WATER,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 6D.
W77-01273

RANGELAND DEVELOPMENT AND MANAGEMENT IN WEST RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
L. D. Ahuja, and H. S. Mann.
Annals of Arid Zone, Vol. 14, p. 29-44, 1975. 2 tab, 33 ref.

Descriptors: *Range management, *Water conservation, *Soil conservation, *Pasture management, *Forages, Range grasses, Stock water, Deserts, Livestock, REvegetation, Drought, Arid lands, Brush control, Stabilization, Grazing, Animal control.
Identifiers: *Rajasthan, *India.

Range and pasture development in the arid zone of Rajasthan, while potentially very good, involves development and conservation of soil and water resources, and selection of the more productive, palatable and drought resistant plants to provide the required food. Various techniques for management and improved utilization of rangelands and pastures are presented and evaluated. A major problem in the interior areas of the desert is lack of drinking water for livestock. Drinking water requirements for range animals are presented. For good livestock production and improvement of the economy of the arid regions, rational use of the pasture is essential. (Jamail-Arizona)
W77-01281

POTENTIAL FOR WATER YIELD IMPROVEMENT IN ARIZONA THROUGH RIPARIAN VEGETATION MANAGEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W77-01282

THE EFFECT OF ENVIRONMENTAL FACTORS ON THE GROWTH OF A NATURAL PASTURE,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 2I.
W77-01285

MECHANICAL CONTROL OF EURASIAN WATERMILFOIL IN MARYLAND WITH AND WITHOUT 2,4-D APPLICATION,
Maryland Univ., Solomons. Chesapeake Biological Lab.
C. K. Rawls.
Chesapeake Science, Vol. 16, No. 4, p. 266-281, 1975. 2 fig., 4 tab., 27 ref.

Descriptors: *Integrated control measures, *Aquatic weed control, *Chesapeake Bay, Mechanical control, *Maryland, *2,4-D, Herbicides, Salinity, Growth rates.
Identifiers: *Eurasian watermilfoil, 2,4-D butoxyethanol ester, 2,4-D iso-octyl ester.

Eurasian watermilfoil (Myriophyllum spicatum) is a major nuisance in the upper part of Chesapeake Bay. Between 1961-1964 studies were made in Herring and Dundee Creeks to determine effective control methods. Normally milfoil reached the surface by early May and began to sink in high salinity waters about September 15 and in lower salinities about October 15. Mowing usually had to be repeated at least monthly during the growing season from mid-May to mid-September. Mowing was only effective for the season in which it was made. New nodal growth from cut milfoil stems or fragments made mowing impractical for large areas. If cutting was followed by herbicide application when new growth offered sufficient vegetative containment of applied 2,4-D impregnated attaclay granules, the vulnerable period of milfoil to 2,4-D was extended beyond anthesis. The 2,4-D butoxyethanol ester was more effective than the iso-octyl ester. No adverse effects to endemic fauna and flora were observed. Submersed waterfowl food plants, retarded by the milfoil overstory, grew rapidly when milfoil was thinned or removed. (Buchanan-Davidson--Wisconsin)
W77-01289

COMPARISON OF TWO MATHEMATICAL MODELS OF SURFACE RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-01334

DEALING WITH VARIABLE FLOOD HAZARD,
Corps of Engineers, Fort Worth, Tex.
For primary bibliographic entry see Field 6F.
W77-01343

WATER AVAILABLE FOR ENERGY--UPPER COLORADO RIVER BASIN,
Utah State Engineer's Office, Salt Lake City.
For primary bibliographic entry see Field 3E.
W77-01350

IDENTIFYING URBAN FLASH FLOODING PROBLEMS,
Washington Univ., St. Louis, Mo. Dept. of Technology and Human Affairs.
W. P. Darby, and M. J. Small.
Journal of the Water Resources Planning and Management Division, Vol. 102, No. WR2, Proceedings of the American Society of Civil Engineers, p 349-363, November, 1976. 2 fig, 7 tab, 1 equ, 13 ref.

Descriptors: *Flash floods, *Flood control, *Land use, *Statistical methods, *Streams, *Watersheds(Basins), Floods, Forecasting, Runoff, Mathematical models, Planning, Systems analysis, Methodology.
Identifiers: *Urban development, Water plans, Multiple discriminant analysis.

The focus of flood control activities in urban areas has been the alleviation of problems associated with major river flooding. Meanwhile, unplanned urban development has caused flooding problems of small streams to worsen, and eventually to

receive priority attention. Because of limited resources, flood control agencies must choose individual streams for immediate attention, while deferring flood control action on others. Very little direct information exists upon which to base an evaluation of the relative flash flooding problems of individual streams. A methodology, based on multiple discriminant analysis, is presented to provide a decision-making tool to establish flash-flood control priorities among a number of urban streams. The analysis is based on indirect measures of flash flooding problems (land-use characteristics of the watershed, stream configuration, etc.) that are readily available to the flood control agency, instead of flood damages inventories and hydrologic data, which are often unobtainable. Using the discriminant models, individual streams can be singled out for priority action. (Bell-Cornell)
W77-01351

A LABORATORY EVALUATION OF A DYE FOR THE CONTROL OF ALAGAL GROWTH,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W77-01355

A TWO-DIMENSIONAL FLOOD ROUTING MODEL,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
H. W. Weiss, and D. C. Midgley.
The Civil Engineer in South Africa, Vol. 16 (12), p 359-365, p 113-114, (1974).

Descriptors: *Mathematical models, *Flood routing, *Flood plains, Retention, River systems, Channel flow, Model studies, Management, Water storage.
Identifiers: South Africa, Flood retention basins, Cross flow patterns, Crosslinking.

A cell-type mathematical model has been developed for routing of floods through complex river systems in which due account must be taken of storage attenuation effects, cross channel flow and flow reversals between channel and side-valley storage. Finite difference solutions of the simplified energy and continuity equations have been tested for stability and the model is ready for field calibration. It is intended as an aid to improved flood plain management. (South Africa)
W77-01358

A HYDRO-ECONOMIC EVALUATION OF FORESTRY IN THE EERSTE RIVER CATCHMENT,
Department of Forestry, Pretoria (South Africa).
D. W. Van Der Zel, and P. C. De Villiers.
Forestry in South Africa, No. 16, p. 19-26, (1975). 2 fig, 6 tab, 13 ref.

Descriptors: Forest watersheds, Forest management, River basins, Watersheds(Basins), River flow, Economics, Mathematical models, Water yield, Africa, Watershed management.
Identifiers: *South Africa, *Eerste River.

The present and possible future place of forestry in the Eerste River Catchment is illustrated and evaluated by a number of economic and hydro-economic formulae. It is shown that an area of 5000 ha of unused mountain land is available for forestry. An area of 3500 ha could be afforested and could add an annual R300 000 to the gross regional product (G R P). A mathematical model is developed from the evaluations to show that water use of the present situation on a forestry farm in the upper catchment of the Eerste River does not differ from that of the optimum mixed farming recommendation. Forestry in catchment areas in the Western and Southern Cape is justified and can be practised without detrimentally influencing other land owners in, or the water yield from such catchments. (South Africa)
W77-01368

THOR ACROSS THE LIMPOPO.
For primary bibliographic entry see Field 8A.
W77-01369

AFFORESTATION, CATCHMENT PROTECTION AND WATER SUPPLY DEMANDS,
Australian National Univ., Canberra. Dept. of Forestry.
For primary bibliographic entry see Field 4D.
W77-01371

ORANGE RIVER PROJECT, RIVER DIVERSION AT P K LE ROUX DAM,
For primary bibliographic entry see Field 8A.
W77-01372

EXPLORING THE DRAKENSBERG.
Construction in Southern Africa, Vol 20 (5), p. 93, 95, (1975).

Descriptors: Geologic investigations, Interbasin transfers, Water demand, Shafts, Tunneling, Hydroelectric plants, Pumped storage, Contracts, Hydraulic aspects, Rivers.
Identifiers: Tugela River, Vaal River, *South Africa.

A description is presented of the Tugela-Vaal Scheme in which water from the Tugela River is pumped over the Drakensberg escarpment to the Vaal River, which serves the major South African urban and industrial expansion areas, and has virtually reached its limit. The Scheme not only supplies water to the Vaal River but, making use of the pumped storage principle, generates 1000 MW of peaking power for the national electricity network. A description is given of the geological survey that preceded the excavation of the large underground cavern situated 195 m below ground level, which will be the machine hall, as well as details regarding the shafts and tunneling that coincided with the operation. (South Africa)
W77-01373

SOUTH AFRICA'S OWN SNOWY MOUNTAIN SCHEME,
For primary bibliographic entry see Field 8C.
W77-01374

R10 MILLION WATER SCHEME NEARS COMPLETION, IRRIGATING THE ISLANDS OF THE ORANGE.
For primary bibliographic entry see Field 3F.
W77-01375

HARNESSING THE CUNENE'S MIGHT.
For primary bibliographic entry see Field 8C.
W77-01376

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN--VOLUME 1. OHIO RIVER BASIN ABOVE KANAWHA RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-01412

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-01413

STATISTICAL ANALYSIS OF WATER-LEVE SPRINGFLOW, AND STREAMFLOW DAT FOR THE EDWARDS AQUIFER IN SOUT CENTRAL TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W77-01417

MUNICIPAL WATERSHED MANAGEMEN SURVEY,
Forest Service (USDA), Franklin, N.C. Cowee Hydrologic Lab.
For primary bibliographic entry see Field 4D.
W77-01422

SIMULATION OF EVAPOTRANSPIRATIO AND DRAINAGE FROM MATURE AN CLEAR-CUT DECIDUOUS FORESTS AN YOUNG PINE PLANTATION,
Forest Service (USDA), Franklin, N.C. Cowee Hydrologic Lab.
For primary bibliographic entry see Field 2D.
W77-01424

ESTIMATING WATER YIELD DIFFERENC BETWEEN HARDWOOD AND PINE FOREST AN APPLICATION OF NET PRECIPITATIO DATA,
Forest Service (USDA), Grand Rapids, Mi North Central Forest Experiment Station
For primary bibliographic entry see Field 3B.
W77-01425

A CHART FOR RESERVOIR YIELD ESTIM TION BASED ON THE MARKOV PROCESS,
T. B. Mitchell.
The Civil Engineer in South Africa, Vol 16 (9) 289-293, (1974). 3 fig, 6 tab, 4 ref.

Descriptors: *Reservoir yield, *Storage coef cient, Evaporation, *Markov processes.
Identifiers: South Africa.

A simple example of the Markov process fo reservoir is outlined and a chart for the estimati of the yield of a reservoir with a gamma inflow d tribution is presented in terms of storage ra coefficient of variation of annual inflow, reserv evaporation characteristis and probability r level. (South Africa)
W77-01445

FLOOD PROBLEMS IN UTTAR PRADESH,
Irrigation Commission, Lucknow (India).
For primary bibliographic entry see Field 2E.
W77-01450

DESIGN FLOOD SYNTHESIS BY EXCESS RA ROUTING,
University of the Witwatersrand, Johannesb (South Africa). Hydrological Research Unit.
For primary bibliographic entry see Field 2A.
W77-01452

ENRICHMENT WILL MAKE US POOR (VERRYKKING GAAN ONS ARMER MAAK)
National Inst. for Water Research, Preto (South Africa).
For primary bibliographic entry see Field 5G.
W77-01456

THE KARAKAYA DAM AND HYDRO-EL TRIC PROJECT IN EASTERN TURKEY,
For primary bibliographic entry see Field 8C.
W77-01465

CHANGE IN BIG DAM PLAN.
For primary bibliographic entry see Field 8D.
W77-01476

ELIFT TO BEAT THE FLOODS.
primary bibliographic entry see Field 8A.
-01477

M DAM PLAN FOR THE LOWVELD.
primary bibliographic entry see Field 8A.
-01478

BER AND WATER,
primary bibliographic entry see Field 4C.
-01480

LICATION OF MUNICIPAL BY-LAWS H SPECIAL REFERENCE TO DRAINAGE GULATIONS,
nnesburg City Engineer's Dept. (South ca).
I. C. Kroger.
icipal Engineer, Vol 6(3), p 43-47, (1975).

criptors: *Legislation, *Drainage systems, gn criteria, *Urban drainage, *Water laws, es, Standards, Training.
tifiers: *South Africa.

hasis is placed on the need to update existing, mpile new, standard regulations and by-laws, particular reference to drainage-system gn. The importance of co-operation between local authorities and the parties concerned design and construction, is stressed. The is expressed that formal training of both ling and drainage inspectors - on a national - will eventuate in the near future, and that a lementary technical handbook be prepared, to e as basis for a common code, thereby obviat- ossible misinterpretation. (South Africa)
-01485

GENI RIVER CATCHMENT ANALYSIS,
artment of Forestry, Pretoria (South Africa).
primary bibliographic entry see Field 4D.
-01488

TUGELA-VAAL STATE PROJECT, (DIE ELA-VAAL STAATSWATERPROJEK),
artment of Water Affairs, Pretoria (South ca).
C. Van Robbroeck.
TERN, Vol XXV (1), p 47-58, (1975).

criptors: Hydroelectric plants, *Pumped ge, Dam design, Flood control, Peak runoff, sites, *Inter-basin transfers, Resources lopment, Evaporation, Industrial water, Ir- ion water, *Water supply, *Projects, ltiple-purpose projects.
tifiers: *Vaal River, Tugela river, Sterkfon- dam, Spioenkop dam, *South Africa.

t from supplying the bulk of the water to the oria-Witwatersrand-Pretoria complex the Vaal also has to provide in the water requirements parian owners, the Free State goldfields, the -Hartz Irrigation Project and many of the hern Cape mining communities. To augment nadequate water supplies of the Vaal river and basin transfer scheme brings water from the la river across the Drakensberg escarpment the head-waters of the Vaal river. The ad- ages of the scheme are explained and details e Sterkfontein and Spioenkop Dams as well as arious tunnels, canals and pumping installa- are given. Mention is also made of the ped storage scheme that contributes 1000 MW e national electricity network during peaking (South Africa)
-01490

ROACHES TO MULTI-OBJECTIVE NNING IN WATER RESOURCE PRO-

JECTS,' BY BERNARD W. TAYLOR III, K. ROSCOE DAVIS, AND RONALD M. NORTH,
Cornell Univ., Ithaca, N. Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6B.
W77-01510

EVALUATION REPORT: WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING. DAYTON DEVELOPMENT, PROJECT NO. 287, FOX RIVER, WISCONSIN AND ILLINOIS.
Federal Power Commission, Washington, D.C. Bureau of Power.
For primary bibliographic entry see Field 6F.
W77-01511

PROSPECTS OF HYDROMETRY IN THE LIGHT OF MODERN TECHNOLOGY,
International Commission on Irrigation and Drainage, New Delhi (India).
For primary bibliographic entry see Field 7B.
W77-01519

4B. Groundwater Management

THE IMPACT OF INCREASED ENERGY COSTS ON WATER USE AND AGRICULTURAL OUTPUT IN NORTHWESTERN OKLAHOMA,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W77-01056

DEEP WELL WASTES MAY BE WATER HAZARDS.
For primary bibliographic entry see Field 5B.
W77-01083

WATER MANAGEMENT AND ADMINISTRATION IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01101

HYDROGEOLOGY OF THE QUATERNARY AND TERTIARY FORMATIONS ALONG THE SOUTH COAST OF THE ALGARVE PORTUGAL,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 2F.
W77-01136

HYDRODYNAMICS OF PERCHED MOUNDS,
California State Univ., Fullerton. Dept. of Civil Engineering.
R. R. Brock.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY8, Proceedings Paper No. 12305, p 1083-1100, August 1976. 8 fig, 1 tab, 7 ref, 3 append.

Descriptors: *Artificial recharge, *Recharge ponds, *Perched water, *Water table, *Groundwater recharge, Groundwater, Permeability, Porous media, Hydraulics, Mathematical studies, Analysis, Aquifers, Saturated flow, Aquitards, Dupuit-Forchheimer theory, Equations.

Perched mounds develop beneath artificial groundwater recharge basins where one or more horizontal semipervious layers are located below the basin. The shape of perched mounds was investigated by use of the saturated flow equations and the Dupuit-Forchheimer approximation. Finite difference techniques were used to solve for the mound shape under rising and steady-state conditions beneath strip and circular basins. Analytical solutions were obtained for certain limiting conditions. Results for the maximum mound thickness were presented in the form of dimensionless curves involving permeability of semipervious layer and the soil above the layer, thickness of layer, effective porosity and recharge rate from the basin. The equations and assumptions used for a single layer were also used for a multiple layer situation. A computer program was developed for a three layer case, and its use was illustrated with a numerical example. (Adams-ISWS)
W77-01141

UNSTEADY GROUNDWATER FLOW BENEATH STRIP OCEANIC ISLANDS,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2F.
W77-01143

AQUIFER MANAGEMENT UNDER TRANSIENT AND STEADY-STATE CONDITIONS,
Stanford Univ., Calif. Dept. of Applied Earth Sciences.
W. M. Alley, E. Aguado, and I. Remson.
Water Resources Bulletin, Vol. 12, No. 5, p 963-972, October 1976. 4 fig, 1 tab, 7 ref.

Descriptors: *Aquifers, *Management, *Groundwater, *Linear programming, *Optimization, Wells, Distribution, Pumping, Decision making, Methodology, Constraints, Mathematical models, Equations, Systems analysis.
Identifiers: *Finite differences, *Steady-state flow.

The equations of transient and steady-state flow in two-dimensional artesian aquifers are approximated using finite differences. The resulting linear difference equations, combined with other linear physical and management constraints and a linear objective function, comprise a linear programming (LP) formulation. Solutions to such LP models are used to determine optimal well distributions and pumping rates to meet given management objectives for a hypothetical transient problem for a steady-state field problem. (Bell-Cornell)
W77-01169

LINEAR MODELS FOR GROUNDWATER MANAGEMENT,
Water Planning for Israel Ltd., Tel-Aviv.
J. Schwarz.
Journal of Hydrology, Vol. 28, No. 2/4, p 377-392, February 1976. 3 fig, 9 ref.

Descriptors: *Groundwater, *Management, *Water resources, *Linear programming, Economics, Aquifers, Storage, Hydraulics, Planning, Optimization, Constraints, Surface waters, Conjunctive use, Pumping, Mathematical models, Equations, Systems analysis.
Identifiers: *Influence model, *Transformation model, Superposition principle, Cost minimization, Benefit maximization.

Managing groundwater aquifers as storage systems may be formulated as a linear programming problem. In most cases, groundwater systems may be considered as linear systems. Standard and extended linear programming routines enable planning and management of complex systems, i.e., alternative users and sources, limited budgets, staged projects, and stochastic inputs. Described are the two different applications of linear programming to the management of groundwater: the one based upon influence equations and the one based on transformation equations. In conclusion, the transformation model is preferable for a small number of cells with time variations of the objective function or with ran-

dom variables such as natural replenishment. The influence model is less restricted by the number of cells but is less adaptable to time varying conditions. The transformation model is especially suited for evaluating operational rules of a conjunctive supply system with different sources and users. (Bell-Cornell)
W77-01180

THE GROUND WATER LEGAL REGIME AS INSTRUMENT OF POLICY OBJECTIVES AND MANAGEMENT REQUIREMENTS,
City Univ. of New York.
For primary bibliographic entry see Field 6E.
W77-01181

A SUBURBAN MODEL OF RATIONAL GROUND WATER UTILIZATION: A PLAN FOR NASSAU COUNTY,
City Univ. of New York.
R. White.
In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, Feb. 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (Coplanarh), Caracas, Venezuela, p 310-330, 1976. 21 p, 2 fig, 20 ref.

Descriptors: *New York, *Water reuse, *Groundwater potential, *Groundwater mining, *Water yield, Water supply, Water table, Aquifers, Water policy, Water resources, Water balance, Aquifer systems, Aquifer management, Groundwater availability, Local governments, Water quality control.
Identifiers: *Nassau County.

Nassau County, located adjacent to New York City on Long Island, obtains all of its water supply from groundwater sources. There is, however, no regional or sub-regional plan for the utilization and protection of these resources. At the present time, they are being slowly exhausted. This paper proposes the implementation of a rational groundwater utilization plan. The general concept of recharging the ground water tables with treated waste water is a logical addition to the use of ground water replenishment reservoirs. Complete sewering should be implemented and unused cesspools drained. Cost, of course, is a factor. Present mining of the ground water reservoir should be recognized as temporary, since the water table level has been noticeably lowered in the past 15 years. This mining has also brought about the problem of saltwater intrusion. The two most hoped-for solutions are: (1) for Nassau County to renovate and recycle an amount of water equivalent to withdrawal in excess of permissive sustained yield; and (2) for Nassau County to work with Suffolk County, which has a water excess, for the establishment of a regional groundwater plan. (Frank-Florida)
W77-01182

METHOD FOR LOWERING GROUND WATER,
For primary bibliographic entry see Field 8B.
W77-01196

GEOTHERMAL ENERGY WELL CASING SEAL,
Sperry Rand Corp., New York, (Assignee).
For primary bibliographic entry see Field 8B.
W77-01205

PROGRESS IN THE EXPLORATION AND IN THE SCIENTIFIC RESEARCH OF THE LIBYAN DESERT SINCE GERHARD ROHLFS,
Stuttgart Univ. (West Germany).
For primary bibliographic entry see Field 4A.
W77-01269

A SIMPLE COMPUTER PROGRAM FOR THE DETERMINATION OF AQUIFER CHARACTERISTICS FROM PUMP TEST DATA,
Southwest Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 7C.
W77-01337

COMPARATIVE EFFICIENCY OF GEOPHYSICAL PROSPECTING TECHNIQUES IN WATER-SATURATED SANDS,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 2F.
W77-01361

GEOPHYSICAL EXPLORATION FOR POTABLE GROUNDWATER SUPPLIES IN THE KALAHARI GEMSBOK NATIONAL PARK,
Ruker (Richard) and Associates, Bryanston (South Africa).
E. Martinelli.
Water SA, Vol. 1, No. 2, p 53-56, July 1975. 3 fig, 1 tab, 1 ref.

Descriptors: *Borehole geophysics, Potable water, *Groundwater, *Resistivity, Water quality, Water supply, National parks, *Exploration, Saline water, Deserts, Africa.
Identifiers: *South Africa, Kalahari Desert.

A successful geoelectric case history of prospecting for groundwater near Nossob Camp, Kalahari Gemsbok National Park, is described with particular reference to the delineation of zones of good groundwater quality. The resistivity method, used in conjunction with hydrogeological investigations has been demonstrative in locating and delineating fresh water body overlying and contained within a marginal saline water environment. (South Africa)
W77-01366

GROUND-WATER DATA FOR THE SANTA MARIA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. L. Hughes, and J. R. Freckleton.
Open-file report, May 1976. 444 p, 12 fig, 5 tab.

Descriptors: *Groundwater, *Basic data collections, *Water wells, *Water levels, *Water quality, Chemical analysis, Pumping, Drawdown, Water yield, Specific capacity, Water level fluctuations.
Identifiers: *Santa Maria Valley(Calif), *Well hydraulics.

In 1968 the U. S. Geological Survey began organizing in computer format ground-water data in the Santa Maria Valley, Calif., in cooperation with the California Water Resources Control Board, Central Coast Region, and the Santa Barbara County Water Agency. The valley covers an area of about 260 sq mi and includes the towns of Santa Maria, Orcutt, and Guadalupe. The principal industries are agriculture, oil production, and sugar-beet refinement. This compilation makes available well records, ground-water-quality data, water levels, and well-hydraulics data, which will be useful in future water-resources planning. (Woodard-USGS)
W77-01415

STATISTICAL ANALYSIS OF WATER-LEVEL SPRINGFLOW, AND STREAMFLOW DATA FOR THE EDWARDS AQUIFER IN SOUTH-CENTRAL TEXAS,
Geological Survey, Austin, Tex.
C. Puente.
Edwards Underground Water District Report, July 1976. 58 p, 19 fig, 4 tab, 10 ref.

Descriptors: *Statistical methods, *Water levels, *Aquifers, *Springs, *Streamflow, Forecasting, Flow rates, Equations, Regression analysis, Hydrology, Groundwater movement.
Identifiers: *Edwards aquifer(Tex).

Water-level, springflow, and streamflow d
were used to develop simple and multiple line
regression equations for use in estimating wa
levels in wells and the flow of three major spri
in the Edwards aquifer in the eastern San Anto
Texas, area. The equations provide da
monthly, and annual estimates that compare v
favorably with observed data. Analyses of geol
ic and hydrologic data indicate that the wa
discharged by the major springs is supp
primarily by regional underflow from the west
southwest and by local recharge in the infiltrat
area in northern Bexar, Comal, and Hays Co
ties. Underflow from the artesian aquifer wes
San Marcos Springs may account for 97 percen
the springflow during periods of extreme drou
(1947 to 1956) and only 46 percent during
periods (1973). On a monthly basis, the underf
component ranges from 40 to 100 percent of
total springflow. From January 1950 to Decem
1974, the underflow components accounted
about 60 percent of the total discharge of San M
cos Springs. A hydrograph shows monthly aver
discharge of the Blanco River at Wimberly, Te
from 1934 to 1973. This stream is representativ
the streams draining the Edwards Plateau in
study. (Woodard-USGS)
W77-01417

**ESTIMATED GROUNDWATER YIELD F
LOWING STRIP CUTTING IN PINE PLAN
TIONS,**
Forest Service (USDA), Cadillac, Mich. N
Central Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W77-01426

**HYDROGEOLOGICAL AND GEOPHYSIC
INVESTIGATIONS OF A GEOTHERM
ANOMALY IN HUNGARY; II. GEOTHERM
FLOW SYSTEM IN THE TISZAKECSKE
GION,**
Research Inst. for Water Resources Developm
Budapest (Hungary).
L. Alfoldi, M. Erdelyi, J. Galfi, K. Korim, and
Liebe.
Hydrological Sciences Bulletin, Vol 21, No
301-313, June 1976. 8 fig, 1 tab, 5 ref.

Descriptors: *Geothermal studies, *Boreh
Reservoirs, Hydrogeology, *Geophysics, W
Sedimentary rocks, Sands, Gravels, Water y
Drilling.
Identifiers: *Hydrogeological investigat
*Tiszakecske region(Hungary), *Hung
Geothermal flow system, Thermal reser
system, Geothermal wells, Thermal water che
try.

The thermal water reservoir system which
developed by boreholes in recent years ar
Tiszakecske and Lakitelek was subjected t
tense investigation. The study confirmed and
tended the knowledge of the geothermal anor
revealed previously in Part I of this report (Al
and Galfi, 1966). The development of this w
water geothermal field was carried out through
exploratory and extension wells. Their de
ranged from 250 to 2048 m and penetrated a
mentary sequence of Quaternary-Pliocene
Miocene age. The areal extent of the study
was approximately 150 sq km. Two thermal w
reservoir systems could be distinguished: an u
formation consisting of sand and gravel of Qu
nary age, and a deeper formation including a
series of Pliocene age. In analyzing the n
reservoir parameters and pressure-volume-
perature relations and considering the geolo
conditions, a communication between the
reservoir systems was supposed. The local,
surface geothermal anomaly was due to ascend
relatively warm water from the deeper the
water layer under special geological, hydrodyn
ic, and thermodynamic conditions. By

son, in the southern part of the study area, a
ıtive geothermal anomaly was found to be in-
nced by the descending cold water of meteoric
in. (Roberts-ISWS)
-01436

POINTING BOREHOLES ELECTRICALLY.
primary bibliographic entry see Field 2F.
-01448

ALUATION OF GEO-HYDROLOGIC CON-
NTS FOR THE FAR WEST RAND
OMITIC FORMATIONS,
versity of the Witwatersrand, Johannesburg
ıth Africa). Dept. of Civil Engineering.
. Schwartz, and D. C. Midgley.
Civil Engineer in South Africa, Vol 17 (2), p
6, 178-180, (1975). 9 fig, 3 tab, 5 ref.

criptors: Dolomite, Groundwater basins, Sub-
ace waters, Hydrogeology, Groundwater
age, Groundwater movement, Dewatering,
es.
ıtifiers: South Africa, West Driefontein Mine,
k compartment.

owing the sudden inrush of water into the
t Driefontein mine in October 1968, an analy-
ased on the Theis non-equilibrium approach
carried out to determine the transmissivity
storativity of the dolomitic formations of the
k Compartment which has an exposed areal
nt of 156 km2 and a thickness of about 1000 m.
ıils of the analysis are given and the predicted
onse of the water table is compared with that
ined in the subsequent dewatering operations
he compartment which revealed Sevealed
ogic inhomogeneities. (South africa.
-01449

D 'SPONGE' WILL STORE RECLAIMED
TER.
struction in Southern Africa, Vol 20 (5), p 61-
1975).

criptors: *Sand aquifers, *Water storage,
ter reuse, Water purification, Financing,
ghts, Water supply.
ıtifiers: *South Africa, Cape Flats.

laimed water from purified sewage may soon
tored for future use in the natural reservoir
ed by sand deposits on the Cape Flats, which
as a gigantic sponge. This possibility, which
counteract droughts in the Cape Peninsula,
arisen from research carried out by the CSIR's
onal Institute for Water Research, on behalf
ne Water Research Commission. Progressive
gration of reclaimed water into present water
ly systems will boost the amount of water that
be reclaimed from 50 Ml per day in 1978 to 425
per day by the year 2000, which would be
valent to nearly 50 per cent more than the
ent fresh water demand in the Cape Peninsu-
Two of the attractions of the Cape Flats
fer as a water supply source are its close prox-
y to both consumers and sewage purification
ts, and the buffer capacity provided by its tre-
dous storage capacity. The latter is sufficient
tisfy the entire demand of Cape Town and en-
ns for more than three years without any natu-
or artificial recharge taking place. (South
ca)
-01451

Effects On Water Of Man's Non-Water Activities

URE CHEMICAL COMPOSITION OF THE
AT SALT LAKE BRINES,
ham Young Univ., Provo, Utah.
primary bibliographic entry see Field 2H.
W77-01053

URBAN STORM WATER RUNOFF: A TWO-FOLD PROBLEM,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01098

REDEVELOPMENTS ON THE OCEANFRONT,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01100

SETTLEMENTS IN THE RAJASTHAN CANAL IRRIGATION AREA, INDIA,
B. D. Bhattacharya.
Ekistics, Vol. 41, No. 242, p. 46-49, January, 1976. 5 fig, 2 tab.

Descriptors: *Human population, *Irrigation canals, *Relocation, *Deserts, Comprehensive planning, Rural areas, Area redevelopment, Social aspects, Asia, Irrigated land.
Identifiers: *India, *Rajasthan.

Relocation and settlement of from 2 to 2.5 million people in an irrigated area of desert land in India near the border with Pakistan is discussed. Mean average rainfall varies from 150 mm to 400 mm and water is the major limiting factor to development of the area. The Rajasthan Canal will bring water to irrigate about 2 million hectares of desert land, thus far the canal network has reached halfway. 400,000 hectares of land have been permanently alloted to cultivators, enabling 80,000 families to settle. Article discusses the basic plan for the layout of villages, market towns, crop production and transportation network. Population in the area has doubled from 200,000 in 1961 when the first water was released to 400,000 in 1975. (Jamail-Arizona)
W77-01272

SALT STORAGE AND RUNOFF IN URBAN WATERSHED,
Utah State Univ., Logan. Watershed Science Unit; and Utah State Univ., Logan. Dept. of Forestry and Outdoor Recreation.
For primary bibliographic entry see Field 5B.
W77-01336

IS MAN CHANGING THE WEATHER.
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 3B.
W77-01353

CATCHMENT RESEARCH AT ZACHARIASHOEK,
Jonkershoek Forest Research Station, Stellenbosch (South Africa).
For primary bibliographic entry see Field 4D.
W77-01386

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W77-01419

ESTIMATED GROUNDWATER YIELD FOLLOWING STRIP CUTTING IN PINE PLANTATIONS,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
D. H. Urie.
Water Resources Research, Vol. 7, No. 6, December 1971, p. 1497-1510. 11 fig, 2 tab, 15 ref.

Descriptors: *Groundwater, Streamflow, Vegetation, *Base flow, Pine trees, Water yield, *Jack Pine Trees.
Identifiers: *Strip cutting.

Groundwater recharge balances were determined under 40-acre of blocks of a jack pine (Pinus banksiana Lamb) plantation in northwestern lower Michigan during the 4 years following te removal of 50% of the trees in clear-cut strips. Analyses were made by graphical interpretation of diurnal fluctuations and by use of finite difference equations. In the numerical method, weekly water table elevation measurements over each 40-acre block were used to determine water table convexity, which was then linearly related to the groundwater inflow-outflow balance. Results from both methods of analysis showed the effect of strip cutting as increased groundwater yields. Estimates of water yield by the two methods differed primarily as a result of poor estimates of net evaporative loss from the saturated zone using the graphical method. Three other tests of cutting effects on groundwater recharge supported the budget estimates of treatment effect. Approximately 3 inches per year of additional water was produced as a result of the strip cut during the first 4 years after cutting. The numerical analysis showed that the amount of treatment effect decreased rapidly over this period. (Forest Service)
W77-01426

NATURAL FILTERING OF SUSPENDED SOIL BY A STREAM AT LOW FLOW,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
N. H. Miner.
Research Note, PNW-88, September 1968, 4 p, 1 fig, 2 ref.

Descriptors: *Filtration, *Suspended solids, *Sediments, Low flow, Soil erosion, Streamflow, Road construction, *Soil management.

During road construction soil that is added to a stream by tractors crossing during low flow is temporarily 'filtered' out before it travels far. Five-gallon samples were taken at 150, 300, 600, 1,200 feet downstream from a road crossing, with sodium fluorescein dye used as a tracer. Suspended particle concentration was reduced from 1,055 p.p.m. at 150 feet below the road to 108 p.p.m. at 1,200 feet. The 'filtering' action is a combination of settling larger particles and dilution of sediment-laden water. This filtration is temporary and deposited soil will tend to be flushed downstream during high flows and may cause channel erosion or other damage. (Forest Service)
W77-01428

TIMBER AND WATER,
C. L. Wicht.
South African Forestry Journal, 85, p 3-11, (June 1974). 4 fig, 44 ref.

Descriptors: Drainage basins, *Forest management, Wildlife management, Ecology, Transpiration, *Lumbering, Water yield, *Watershed management, Watersheds(Basins).
Identifiers: South Africa, Drakensberg, Jonkershoek.

A discussion is presented of the management measures that can be applied in mountain catchments if timber and/or water production are the objectives of the management concerned. Catchments are managed by applying knowledge of ecology, engineering and concomitant branches of science, in silvicultural practice, pasture management, wildlife conservation and outdoor recreation. The catchments considered are typical of those found in humid, cool-temperate and warm-temperate forest regions. Also discussed are timber production from the catchments, water yield from the catchments and coordination of results from the catchment experiments. (South Africa)

W77-01480

4D. Watershed Protection

COOPERATIVE CONTROL OF INTERNATIONAL POLLUTION AND COMMON PROPERTY RESOURCES,
University of Western Ontario, London.
For primary bibliographic entry see Field 5G.
W77-01290

COFFEE POND WATERSHED MANAGEMENT PLAN.
Maine Dept. of Environmental Protection, Augusta. Bureau of Water Quality Control.
For primary bibliographic entry see Field 5G.
W77-01292

FOREST LAKE WATERSHED MANAGEMENT PLAN.
Maine Dept. of Environmental Protection, Augusta. Bureau of Water Quality.
For primary bibliographic entry see Field 5G.
W77-01293

A HYDRO-ECONOMIC EVALUATION OF FORESTRY IN THE EERSTE RIVER CATCHMENT,
Department of Forestry, Pretoria (South Africa).
For primary bibliographic entry see Field 4A.
W77-01368

AFFORESTATION, CATCHMENT PROTECTION AND WATER SUPPLY DEMANDS,
Australian National Univ., Canberra. Dept. of Forestry.
D. M. Stodart.
South African Forestry Journal, No. 93, p. 12-20, (1975). 7 fig, 2 tab, 7 ref.

Descriptors: Drainage basins, Forest management, Management, *Vegetation effects, Streamflows, *Forest watersheds, *Watershed management, Watersheds(Basins), *Water demand, Water supply.
Identifiers: *South Africa.

The author contends that the vegetation cover of a catchment is a significant factor determining the behaviour of the catchment and that it influences the total water yield of the catchment, the flood and drought flows associated with water yields, the risk of erosion and the quality of the water. He takes a look at the effects of plant cover on stream-flow, at the management of catchment vegetation and reservoir behaviour and catchment management policies and water supply demand. He comes to the conclusion that the significance of the effects of treatment of the vegetation of mountain catchments either by replacing it with plantations or by prescribed burning can be assessed in relation to both the patterns of the water supply demand and the provision of storage to regulate streamflow. (South Africa)
W77-01371

ALLOCATION OF WATER TO FORESTRY AND OTHER USERS IN THE CATCHMENT OF THE EERSTE RIVER,
Jonkershoek Forest Research Station, Stellenbosch (South Africa).
D. W. Van Der Zel, and C. L. Wicht.
Forestry in South Africa, No. 15, p. 47-55, July 1974.

Descriptors: *Burning, Rainfall-runoff relationships, *Evapotranspiration, River basins, Irrigation, *Watershed management, Water allocation(Policy), *Water distribution(Applied), Systems analysis, Forest management.
Identifiers: *South Africa, *Eerste River, *Fynbos.

A system analysis of the water component within the Eerste River catchment in the Stellenbosch District, Cape Province South Africa, is presented. Input of water from rain, and output through vapour losses and discharge to the sea, are compared. One third of the output is attributed to vapour losses from fynbos and about the same from irrigation, while one fifth flows to the sea. Much water could be saved by treatment of the fynbos (controlled burning) and by improved irrigation. Expansion of research into restriction of vapour losses is recommended. (South Africa)
W77-01385

CATCHMENT RESEARCH AT ZACHARIASHOEK,
Jonkershoek Forest Research Station, Stellenbosch (South Africa).
D. W. Van Der Zel.
Forestry in South Africa, No. 15, p. 23-30, June 1974. 5 fig, 4 tab, 14 ref.

Descriptors: *Burning, Geology, Vegetation, *Evaportranspiration, River basins, Hydrography, Streamflow, River flow, Water yield, Forest management, Rainfall-runoff relationships, *Watershed management, Water quality, Watershed(Basins)
Identifiers: *South Africa, Klein Drakenstein Mountains.

In this first paper in a series on research, five Zachariashoek research catchments, situated in the Klein Drakenstein Mountains of the south-western Cape, are described. Preliminary rainfall figures are included and the topography, geology, vegetation and hydrography are explained. Treatments consist of periodic burning of catchment areas of about 250 ha each on rotations of four and 12 years. Water quantity, regime and quality are regularly measured. Vegetation composition is regularly observed on 50 m2 quadrats and phytomass yields are estimated. Research results should be applicable to a considerable area of mountain catchments in the south-western Cape. (South Africa)
W77-01386

MUNICIPAL WATERSHED MANAGEMENT SURVEY,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
G. E. Dissmeyer, and W. T. Swank.
Journal of the American Water Works Association, Vol 68, No 2, p 97-100, February 1976. 10 tab, 5 ref.

Descriptors: *Municipal water, *Watershed management, *Small watersheds, *Surveys, Data collections, Forest management, *Southeast US, *Land use, *Forest watersheds.

Based on survey data, a general summary is provided of the nature and extent of land uses, management problems, and informational needs for municipal watersheds in the southeastern US. Emphasis is placed on small and heavily forested watersheds and related forestry activities. (Forest Service)
W77-01422

THE RELATIONSHIP BETWEEN NITRATE CONCENTRATIONS IN THE SOUTHERN APPALACHIAN MOUNTAIN STREAMS AND TERRESTRIAL NITRIFIERS,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W77-01423

CLEARING AN ALLIGATOR JUNIPER WATERSHED WITH SAWS AND CHEMICALS: A COST ANALYSIS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. L. Miller.
Research Note RM-183, 1971, 8 p, 4 fig, 6 tab, ref.

Descriptors: *Forest management, Economi *Watershed management, *Cost analys *Juniper trees, Operational costs.
Identifiers: *Alligator juniper watershed conv sion.

Manpower, equipment, materials, and vehi input data were analyzed for seven compon jobs involved in an experimental conversion of alligator juniper watershed to herbaceous co Total operational cost was $45.02 per acre. Ana sis indicates that costs may be reduced subst tially in an operational program through improv organization, changing prescriptions techniques, and further cost studies. (Forest S vice)
W77-01430

STREAMFLOW NITROGEN LOSS FOLLOING FOREST EROSION CONTROL FTILIZATION,
Forest Service (USDA), Portland, Oreg. Pac Northwest Forest and Range Experiment Statio
G. O. Klock.
Research Note PNW-169, November 1971, 10 fig, 10 ref.

Descriptors: *Fertilization, Streamflow, *Soil e sion, *Erosion control, *Nitrogen, *Waters management, *Washington.

Three gaged watersheds, approximately 500 tares in size, in north central Washington severely burned in 1970 wildfire. In an experim tal erosion control seeding program, watersheds were fertilized, one with urea and other with ammonium sulfate. The third waters was retained as an unrehabilitated control. Fo 60-day period during and following fertilizati 1.37 kilograms of urea-N and 2.90 kilograms nitrate-N were estimated to have been carried streamflow from the watershed fertilized with metric tons of elemental nitrogen as urea. On watershed fertilized with 33.16 metric tons of mental nitrogen as ammonium sulfate, 1.45 grams of nitrate-N was estimated to have b transported from the watershed by streamfl (Forest Service)
W77-01431

SEVENTEEN-YEAR SEDIMENT PRODUCTI FROM A SEMIARID WATERSHED IN T SOUTHWEST,
Forest Service (USDA), Fort Collins, Colo. Ro Mountain Forest and Range Experiment Statio
E. F. Aldon, and G. Garcia.
Research Note RM-248, September 1973, 4 fig, 1 tab, 9 ref.

Descriptors: *Erosion control, *Sedime *Watershed management, Litter, Southwest *New Mexico, Flood plains, Semiarid areas.
Identifiers: Rio Puerco(N Mex).

Average annual rate of sediment produc declines 71 percent in the period 1967-71 compa with the period 1956-66 on a 471-acre watershe the Rio Puerco drainage in New Mexico. decline was a result of an increase in plant size litter production on the alluvial flood plain. (Fo Service)
W77-01433

MAXIMUM PEAK FLOW FOR SELECT RETURN PERIODS FOR WATERSHEDS W OF THE CONTINENTAL DIVIDE IN IDA AND MONTANA,
Forest Service (USDA), Ogden Utah. Intermo tain Forest and Range Experiment Station.
N. Bethlahmy.
Research Paper INT-113, 1971, 12 p, 3 tab, 8 re

criptors: *Watershed management, *Peak harge, *Idaho, *Montana, Water yield.

long-term average water yield of a watershed ears to be a good index to the magnitude of its ected peak flow. On the basis of this relation, es are presented showing expected peak flows are applicable to watersheds in Idaho and ntana west of the Continental Divide. Tabud peak flows are for four different return ods: mean annual; 5; 10; and 20 years. Three mples are given to illustrate the tables' field apation. (Forest Service)
-01435

ULTS OF THE MULTIPLE CATCHMENT PERIMENTS AT THE JONKERSHOEK EARCH STATION, SOUTH AFRICA. 2. INENCE OF PROTECTION OF FYNBOS ON EAM DISCHARGE IN LANGRIVIER,
kershoek Forest Research Station, Stellench (South Africa).
. van der Zel, and F. J. Kruger.
estry in South Africa, No 16, p 13-18, (1975). 3 2 tab, 27 ref.

criptors: River basins, Watersheds(Basins), r flow, *Water yield, Transpiration, tershed protection, Africa.
tifiers: Lang River, *South Africa, *Fynbos, ngrivier.

ection of an upland fynbos catchment in the er-rainfall of South Africa resulted in a one cent decrease in streamflow per year of proion. Annual streamflow declined about 500 mm ng the 25 years after an accidental fire in ember 1942. The decrease can be ascribed enly to diminution in streamflow during the ths April to November. No change was ded in dry-season flow. The decrease in streamis ascribed to increased transpiration and inception losses arising from increases in tomass. The decline is substantial and points to need for scientific management of South can mountain catchments to provide a higher stant water yield. (South Africa)
-01474

GENI RIVER CATCHMENT ANALYSIS,
artment of Forestry, Pretoria (South Africa).
. Van Der Zel.
er SA., 1(2), 70-75 (1975).

criptors: System analysis, Land use, *River ns, Watersheds(Basins), *Watershed manage, *Water utilization, Management, Planning.
tifiers: South Africa, *Umgeni River, *Natal.

Umgeni River catchment is analysed as a em, determining how the water is being used in this important Natal river catchment. Analof this nature also brings to the fore the relaimpact of different present and prospective and water uses on the community as a whole. hment systems analysis is shown to be a simput effective way to assist planners and deci makers arrive at dynamic and conclusive mmendations for consistent development g sound ecological and economical lines. th Africa)
-01488

TEX VELOCITY PREDICTION WITH PHASIS DIRECTED TOWARD VORTEX E SEDIMENT TRAP DESIGN,
raska Univ., Lincoln. Dept. of Agricultural neering.
primary bibliographic entry see Field 8B.
-01520

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

MIXED FUNCTION MONOOXYGENASE OF FISH AS AN INDICATOR OF POLLUTION OF AQUATIC ENVIRONMENT BY INDUSTRIAL EFFLUENT,
Oulu Univ. (Finland). Dept. of Pharmacology.
For primary bibliographic entry see Field 5C.
W77-01065

INSTALLATIONS FOR MONITORING OIL CONTENT,
Bailey Meters and Controls Ltd., Croydon (England). (Assignee).
R. M. deVial.
U. S. Patent No 3,965,920, 9 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2025, June 29, 1976.

Descriptors: *Patents, *Monitoring, *Control systems, *Oil pollution, *Oily water, *Pollutant identification, Water pollution, Control systems, Ultraviolet radiation, Equipment.
Identifiers: Ballast water, Tankers, Photo-electric cells.

Installations for monitoring oil content in a stream of water, and more particularly, in a discharge of water ballast from cargo tanks of an oil tanker are described. The installation for monitoring the oil content in a stream of water includes a sampling connection connected to receive a flow of water, an emulsifier connected to receive a fraction of the flow of water from the sampline connection and discharge the fraction, after thorough mixing, to a number of downward discharging orifices having co-planer axes of discharge in a sampling chamber. A beam of ultraviolet radiation of wavelength in the range 200 to 400 n.m. is arranged to be incident upon jets discharged from the orifices. A photoelectric cell receives fluorescent radiation emitted from the jets at wavelengths greater than 400 n.m. An alarm circuit arranged upon the photo-electric cell receiving radiation greater than a predetermined value energises a pneumatically operated alarm system by benting a pneumatic pilot pressure line. (Sinha-OEIS)
W77-01195

OIL-IN-WATER MONITOR,
M. G. Grant.
U.S. Patent No. 3,966,603, 6 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2246, June 29, 1976.

Descriptors: *Patents, *Monitoring, *Oil pollution, *Oily water, *Water pollution sources, *Pollutant identification, Sensors, Equipment, Effluent streams.
Identifiers: Bilge water.

A system for monitoring oil in water which is being transferred from a first to a second location is described. Monitors are needed to ascertain that the separator is performing its function properly, and that the oil in the effluent bilge water is less than a predetermined amount. A pressure vessel coalesces oil from the effluent and gathers the oil in a collection section which is automatically emptied after an hour. If more than a predetermined amount of oil is gathered in the hour, an oil-sensing probe sends a signal to activate a warning light valve which permit pipes to return the effluent to the separator. If the effluent becomes too turbid, a turbidity senser activates an alarm and the valves which permit pipes to return the effluent to the separator. If the coalescer unit clogs, an indication is given by a differential pressure gauge. (Sinha-OEIS)
W77-01201

OCEANOGRAPHIC APPARATUS,
General Dynamics Corp., St. Louis, Mo. (Assignee).
For primary bibliographic entry see Field 2L.
W77-01214

KEPONE: HAZARD TO AQUATIC ORGANISMS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
For primary bibliographic entry see Field 5C.
W77-01235

MODIFIED BIOASSAY PROCEDURE FOR TOXIC EFFLUENTS,
Jyvaskyla Univ. (Finland). Dept. of Biology.
V. Eloranta.
Journal of Water Pollution Control Federation, Vol. 47, No. 8, p. 2172-2177, August 1975. 4 fig., 12 ref.

Descriptors: *Methodology, *Analytical techniques, *Bioassay, *Algae, Laboratory tests, *Toxicity, *Sulfur compounds, *Sulfite liquors, *Industrial wastes, Photosynthesis, Spectrophotometry, Growth rates, Mortality, Water pollution effects, Effluents, Liquid wastes, *Pollutant identification, *Bioindicators.
Identifiers: *Ankistrodesmus sp., Sulfite-lye.

The alga, Ankistrodesmus falcatus var. acicularis was used in a bioassay experiment to determine the toxicity of sulfite-lye at four dilutions. Effluents were added to the cultures when logarithmic growth had been reached after 5 to 7 days. During the light period a mixture of air and 6 percent CO2 was fed into the flasks to maintain a neutral pH. The growth of algae was followed by measuring the chlorophyll a content of the cultures daily. The sulfite lye was found to kill the algae or inhibit their growth at all concentrations used. (Katz)
W77-01243

AROMATIC HYDROCARBONS IN AQUATIC FAUNA,
Atlantic Biological Station, St. Andrews (New Brunswick).
V. Zitko.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 5, p. 621-631, 1975. 2 tab., 4 fig., 12 ref.

Descriptors: *Analytical techniques, *Fluorometry, *Pollutant identification, *Chemical analysis, Creosote, Oil, *Oil pollution, *Aromatic compounds, *Shellfish, Aquatic animals, *Testing procedures, Organic compounds, Oil wastes, Oil spills, Water pollution sources, Methodology, Monitoring.

A rapid method for screening of aquatic fauna for the presence of polynuclear aromatic hydrocarbons is described. The mixture of hydrocarbons is separated from lipids by column chromatography on alumina, characterized and quantitated by fluorometry with pyrene as a fluorescence standard. The method can be used to detect contamination of aquatic fauna by crude oil, fuel oils, and creosote oil. The detection of crude, Bunker C, and creosote oil in the described method is approximately 100, 50, and 100 microgram/gram lipid, respectively. Polynuclear aromatic hydrocarbons of these oils were not detectable in samples of fish and seals. Creosote oil in concentrations ranging from 202 to 3254 micrograms/gram lipid was detected in the samples of shellfish. (Katz)
W77-01247

HEAVY METAL AND CHLORINATED HYDROCARBON RESIDUES IN CALIFORNIA

SEA LIONS (ZALOPHUS CALIFORNIANUS CALIFORNIAUS),
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 5C.
W77-01261

OPTIMUM ALLOCATION STRATEGIES FOR SAMPLING BENTHOS IN THE NEW YORK BIGHT,
Rhode Island Univ., Kingston. Marine Experiment Station.
S. B. Saila, R. A. Pikanowski, and D. S. Vaughan.
Estuarine and Coastal Marine Science, Vol. 4, No. 2, p. 119-128, 1976. 1 fig., 2 tab., 5 ref.

Descriptors: *Sampling, *Methodology, *Analytical techniques, *Optimization, Assay, *Testing procedures, Project planning, Trace elements, Invertebrates, Mathematical studies, *Benthos, *Bioassay, Pollutant identification.
Identifiers: *Marine ecosystems analysis, *New York Bight, Cerianthus americanus.

Sampling plans based on historical data available from the Marine Ecosystems Analysis (Mesa) New York Bight Project are described and illustrated. These plans provide the requisite levels of precision for the minimum expenditure of time and effort. Sampling for a single variable such as selected trace elements is optimized directly. Sampling for several variables simultaneously in a two-stage scheme can also be optimized. The optimization procedure is explained and illustrated in detail and results for a realistic case are given. Relatively few replicates (approximately five) are shown to be required to test reasonably defined hypotheses concerning differences in trace elements between two stations. Sample sizes for seven species were determined and a compromising allocation is discussed. (Katz)
W77-01264

CHRONIC EFFECTS OF REDUCED PH ON BROOK TROUT (SALVELINUS FONTINALIS),
West Virginia Dept. of Natural Resources Elkins. Div. of Wildlife Resources.
For primary bibliographic entry see Field 5C.
W77-01266

MERCURY IN EGGS OF NORWEGIAN SEABIRDS,
Tromsoe Univ. (Norway). Inst. Biology and Geology.
N. Fimreite, E. Brun, A. Froslie, P. Frederichsen, and N. Gundersen.
Astarte, Vol. 7, no. 2, p. 71-76, 1974. 1 fig., 6 tab., 21 ref.

Descriptors: *Mercury, *Bird eggs, *Gulls, *Heavy metals, *Path of pollutants analytical techniques, Metals, Reproduction, Food chains, Food webs, Gas chromatography, Hatching.
Identifiers: *Larus spp., *Norway, Uria spp., Alca spp. Rissa spp., Sula spp. Guillemot, Razorbill, *Seabird eggs.

Seabird eggs from nine locations along the coast of Norway were sampled for mercury content. Mercury levels in Herring Gull eggs from sites below 59 degrees north latitude, averaged 0.34 ppm. From northern localities eggs of Herring Gull (Larus argentatus), Guillemot (Uria aalge), and razorbill (Alca torda) contained less than 0.10 ppm, eggs of Kittiwake (Rissa tridactyla) less than 0.15 ppm, and the Gannet (Sula bassana) 0.58 ppm, all average values. More than 90 per cent of the mercury was in methyl form. (Katz)
W77-01267

A NEW METHOD FOR THE DETERMINATION OF NITRATES IN DRINKING WATER,
Assis Ltd., Ramat Gan (Israel).
J. I. Monselise.
Isr J Technol. 11(3), p 163, 1973.

Descriptors: *Potable water, *Nitrates, *Measurement, Water pollution sources, Spectrometers, Spectrophotometry, *Pollutant identification, Analytical techniques.
Identifiers: *UV spectrophotometry.

An UV spectrophotometric method based on measurement of absorbance at 220 nm was devised and applied to measurements of nitrate concentrations in drinking water samples.--Copyright 1975, Biological Abstracts, Inc.
W77-01278

WORKSHOP ON TOXICITY TO BIOTA OF METAL FORMS IN NATURAL WATER.
International Joint Commission-United States and Canada.
For primary bibliographic entry see Field 5C.
W77-01295

ZINC SPECIATION AND TOXICITY TO FISHES,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-01298

MOLECULAR FORMS OF ARSENIC IN THE ENVIRONMENT,
University of South Florida, Tampa. Dept. of Chemistry.
R. S. Braman.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p. 249-261. April 1976. 3 fig., 4 tab., 7 ref. NSF (RALNN) GI-43753 and AEN 75-14278.

Descriptors: *Arsenic compounds, *Analytical techniques, *Pollutant identification, Freshwater, Sea water, Sodium arsenite, Reduction(Chemical), Air environment.
Identifiers: Inorganic arsenic(III), Methylarsenic acid, Dimethylarsenic acid, Trimethylarsine oxides.

Described is an analytical technique which can determine down to approximately 0.02 ppb or 1 ng ambient concentrations of inorganic arsenic (III), arsenic (V), methylarsenic acid, dimethylarsenic acid, and trimethylarsine odide type compounds in freshwater, seawater, and air. Based upon observation of arsenic atomic emission lines in a d.c. dicharge, the method also involves the separation of arsine and methyl arsines after reduction of corresponding arsenic compounds by sodium borohydride. Acidity of the reduction conditions is important and is used to differentiate between arsenic (III) and (V). The various arsenic acids must also be completely protonated before they can be reduced to the corresponding arsines. Arsenic appears to be higher in lakes or ponds surrounded by fertilized lawns and which have no inflows or outflows. The concentration of methylarsenic compounds increases with the increase in arsenic concentration. Methylarsenic compounds were found in nearshore seawater areas and in association with the sargassum weed in the open oceans; shrimp, barnacles and fish in the sargassum weed ecosystem also showed small amounts of methylarsenic compounds. Air transport is a definite contamination source . Indoor areas, such as greenhouses, exhibited a marked evidence of alkylarsenic compounds in the air. (See also W77-01295) (Auen-Wisconsin)
W77-01302

THE NEED TO ESTABLISH HEAVY METAL STANDARDS ON THE BASIS OF DISSOLVED METALS,
Colorado Div. of Wildlife, Fort Collins. Research Center.
P. H. Davies.
In: International Joint Commission's Worksho
Proceedings 'Toxicity to Biota of Metal Forms i
Natural Water', October 7-8, 1975, Duluth, Minn
p. 93-126, April 1976. 4 fig., 14 tab., 16 ref.

Descriptors: *Heavy metals, *Toxicity *Measurement, *Analytical techniques *Standards, Solubility, Dialysis, Rainbow trou Lead, Alkalinity, Hardness(Water), Lethal limi Chemical precipitation, Cadmium, Polarographi analysis, Spectrophotometry, Silver iodide, Chel tion.
Identifiers: *Application factor.

The toxicity of a particular metal can be dete mined irrespective of water quality when properl analyzed. This has been verified by long-term to icity tests with lead and rainbow trout in hard an soft waters using atomic absorption for total le and pulse polarographic analyses for dissolve lead. The experiments delineate the chemistry lead, its toxicity to trout, and also demonstrate t failure of the application factor approach to pr dict safe heavy metal concentration in differe types of water when chemical analyses are bas on total concentrations of metals. When based analyses of dissolved metals the utility of the a plication factor concept is verified. Its greate potential use may be in predicting safe concentr tions where synergistic and/or antagonist mechanisms exist. The use of dialysis tubing differentiate between dissolved and complex forms of heavy metals is evaluated in investig tions of cadmium toxicity to rainbow trout in ha and soft waters. The effects of filtration analytical results, as a means for identifyi 'dissolved' metal fractions is also discussed. method demonstrates a long-term testi procedure of the 'insoluble compounds' with limits of their solubility constants by measur the toxicity of silver iodide to rainbow trout in so waters. (See also W77-01295) (Auen-Wisconsin)
W77-01305

POTENTIAL ROLES OF METAL-LIGANDS THE MARINE ENVIRONMENT,
Environmental Research Lab., Narragansett, R.
For primary bibliographic entry see Field 5B.
W77-01308

SYMPOSIUM ON STRUCTURE-ACTIVI CORRELATIONS IN STUDIES OF TOXICI AND BIOCONCENTRATION WITH AQUAT ORGANISMS.
International Joint Commission-United States a Canada.
For primary bibliographic entry see Field 5C.
W77-01310

SURFACTANT STRUCTURE AND AQUAT TOXICITY,
Monsanto Chemical Co., St. Louis, Mo.
R. A. Kimerle, R. D. Swisher, and R. M. Schroeder-Comotto.
In: International Joint Commission Symposium 'Structure-Activity Correlations in Studies of To icity and Bioconcentration with Aquatic Org isms,' March 11-13, 1975, Canada Center for land Waters, Burlington, Ontario, p 25-55. 7 fig tab, 12 ref.

Descriptors: *Surfactants, *Toxicity, *Chemica *Molecular structure, *Solubility, Linear alkyl sulfonates, Lethal limit, Sorption, Daphnia, M nows, Food chains, Osmosis, Pollutant identifi tion.
Identifiers: Bioconcentration, Partition coef cient.

An attempt is described to determine the fact influencing measurement of the octanol/water p tition coefficients of surfactants, and the relati ship of surfactant partition coefficient to bioac mulation and acute toxicity. The surfactants s died were series of LAS individual homologs w

chain lengths from 9 to 15 carbon atoms, sentative commercial LAS blends, and a car- lated LAS simulating a degradation polite. The partition coefficient for a given sample may vary up to an order of magnitude ore, depending on LAS (1/c) concentration, nt ratio, and water hardness. Correlation of artition coefficient data with each of the oing toxicological properties indicated that LAS surfactants do behave in a more or less ar manner on Daphnia magna. It was not ble to correlate the partition coefficients with ncentration factors of specific organs and tis- of fathead minnows because LAS was readily olized and eliminated from the body. The metabolite, sulfophylundecanoic acid dis- salt, showed a markedly lower partition cient and acute toxicity. The results suggest n limitations in the applicability of partition cients to prediction of bioaccumulation. ugh the partition coefficient measured for riginal compound may govern its input rate he organism, the clearance of metabolites epend on their own partition coefficients, may greatly differ. (See also W77-01310) -Wisconsin)
01311

CTURE-ACTIVITY RELATIONSHIPS IN TOXICOLOGY,
ries and Marine Service, St. Andrews (New wick). Biological Station.
rimary bibliographic entry see Field 5C.
01313

CTURE-ACTIVITY RELATIONSHIPS AP- D,
sota Univ., Duluth. Dept. of Chemistry.
rimary bibliographic entry see Field 5C.
01314

ISTICAL PROPERTIES OF ENVIRON- TAL DATA: CONSIDERATIONS FOR CCUMULATION AND TOXICITY STU- OF POLLUTANTS,
s State Environmental Protection Agency, gfield.
rimary bibliographic entry see Field 5C.
01316

OMPARISON OF METHODS FOR THE YSIS OF THE RELATIONSHIP EEN CHEMICAL AND BIOLOGICAL ERTIES OF CHEMICALS,
t Labs., North Chicago, Ill.
Martin.
ternational Joint Commission Symposium on ture-Activity Correlations in Studies of Tox- and Bioconcentration with Aquatic Organ- March 11-13, 1975, Canada Center for In- Waters, Burlington, Ontario, p. 143-150. 3 ref.

iptors: *Chemicals, *Toxicity, *Analytical ques, Chemical properties, Biological pro- s, Mode of action, Graphical analysis, ssion analysis, Correlation analysis, ency analysis.
iers: Pattern recognition, Discriminant anal-

atures, strengths and weaknesses of graphi- nalysis, regression analysis, and pattern ition/discriminant analysis are discussed in plication of biota toxicity as related to the ular structure of chemicals. Graphical analy- powerful technique for the analysis of rela- ips between two or three variables. Not only t summarize a relationship in a form easily stood by most scientists, but it can reveal for concern about the quality of a data set. ssion analysis is used to determine a least- s fit of data to some equation. It is impor- not evaluate too many possible variables as predictors; also ionizable compounds present a problem if potency is dependent on the concentration of an un-ionized chemical present. Linear regression analysis is most commonly used in quantitative-structure activity analysis. Non-linear regression analysis can be used to fit any equation, as illustrated by the application to drug absorption from the gastrointestinal tract for which the model involves a log P- dependent equilibrium and a rate determining step, also log-P dependent, out of the membrane into the blood. Pattern recognition and discriminant analysis are useful when the biological data is categorical and there are many associated chemical properties which determine the biological classification. (See also W77-01310) (Auen-Wisconsin)
W77-01319

TOXICITY INDEX FOR PERMITS,
National Field Investigations Center-Denver, Colo.
D. B. Seba.
In: International Joint Commission Symposium on 'Structure-Activity Correlations in Studies of Toxicity and Bioconcentration with Aquatic Organisms,' March 11-13, 1975, Canada Center for Inland Waters, Burlington, Ontario, p. 199-259. 7 fig., 2 tab., 148 ref.

Descriptors: *Toxicity, *Monitoring, *Standards, *Permits, Organic compounds, Molecular structure, Lethal limit, Water pollution control, Chemical properties, Effluents, Chemicals.
Identifiers: *Toxic units.

Water pollution control by the concept of 'toxic units' to be incorporated in an effluent permit system is considered. Because small differences in chemical structure can significantly influence the biologic effects of chemicals it is difficult to accurately forecast the toxicity of compounds to aquatic organisms by extrapolation from exposure data tests on alternative chemicals, it is proposed that a coefficient of relative potency can be derived to substantiate the toxic units concept. This approach to the problem of experimental prediction of adverse effects by the use of a reference substance for which toxicity is known for a particular structure is of possible use. Specific calculations, based on tolerance level median data, are presented for nitro, amine, nitrile, amide compounds, hetercycles, and phenols. A standard is proposed of 0.05 TU (toxic units) based on the tolerance level median 96-hr value or 96-hr exposure survival, and equations on how to measure that standard are shown. While the toxic units measurement contains assumptions and limitations thus its usage is not the ultimate monitoring device, it does place the burden on the discharger to maintain environmental quality control. (See also W77-01310). (Auen-Wisconsin).
W77-01321

CALCULATION OF PARTITION COEFFICIENTS USEFUL IN THE EVALUATION OF THE RELATIVE HAZARDS OF VARIOUS CHEMICALS IN THE ENVIRONMENT,
Pomona Coll. Claremont, Calif. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-01322

RADIATION HAZARD FROM AMERICIUM-BERYLLIUM NEUTRON MOISTURE PROBES,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 2G.
W77-01324

SALT STORAGE AND RUNOFF IN URBAN WATERSHED,
Utah State Univ., Logan. Watershed Science Unit; and Utah State Univ., Logan. Dept. of Forestry and Outdoor Recreation.
For primary bibliographic entry see Field 5B.
W77-01336

THEORETICAL MODEL FOR THE FORMATION OF ION-PAIRS IN SEAWATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2K.
W77-01341

THE DETERMINATION OF CALCIUM- IN SEA WATER, CORALS AND CALCAREOUS ALGAE BY LIQUID SCINTILLATION COUNTING,
Cape Town Univ. (South Africa). Dept. of Biochemistry.
E. L. Bohm, and T. F. Goreau.
Trans. Roy. Soc. So. Afr., Vol 41 (1), p 25-31, (1974). 4 fig, 3 tab, 15 ref.

Descriptors: *Water analysis, *Sea water, *coral, Marine algae, Nitrates, Hydrogen bonding, Performance, *Pollutant identification, Calcium, Plant tissues.
Identifiers: Instagel, ETCS dioxane, *Liquid scintillation counting, South Africa, *Calcium-45, *Calcereous algae.

Calcium isolated from various fractions of corals and algae is converted into nitrate and dissolved in a water-ethyleneglycolmonoethylether-dioxane cocktail in the ratio of 1:2:20 using PPO and 1-dimethyl-POPOP as scintillators. 45Ca in sea water is counted directly after dilution of 1:10 with water. The carrier capacity of the system is 3 mmole Ca (NO3)2/23 ml (120 mg Ca). The counting efficiencies at minimum and maximum carrier concentration are 88,7% and 78,5% respectively. The scintillator solvent system is chemically stable and counts are highly reproducible. Instagel in the ratio of 10 ml to 1 ml aqueous solution gives counting efficiencies in the region of 80%. Sea water can be incorporated directly. Algal calcium is counted as the nitrate or the chloride. The carrier capacity of Instagel is higher and the counting efficiency is less affected by large concentrations of carrier and excess acid. (South Africa)
W77-01390

THE EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS. 1. RIETVLEI DAM,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5C.
W77-01391

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS. II. HARTBEESPOORT DAM,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5C.
W77-01392

LIMNOLOGICAL DATA REPORT FOR THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION--U. S. GEOLOGICAL SURVEY COOPERATIVE LAKE STUDIES PROJECT,
Geological Survey, Augusta, Maine.
For primary bibliographic entry see Field 2H.
W77-01414

GROUND-WATER DATA FOR THE SANTA MARIA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W77-01415

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1971-SEPTEMBER 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W77-01416

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W77-01419

LEAF ANALYSIS PROVES USEFUL IN INCREASING EFFICIENCY OF NITROGEN FERTILIZATION OF ORANGES AND REDUCING NITRATE POLLUTION POTENTIAL,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5G.
W77-01434

THE SPECTROMETRIC DETERMINATION OF MERCURY (AT 253,65 NM) IN NATURAL WATER - A BRIEF LITERATURE SURVEY,
National Physical Research Lab, Pretoria (South Africa).
R. J. Watling, and Helen R. Watling.
Water S A., Vol 1 (3), p 113-117, (1975). 1 fig, 3 tab, 33 ref.

Descriptors: *Pollutant identification, *Water analysis, Natural waters, Heavy metals, *Mercury, Fluorescence, *Spectroscopy, Trace elements, Analytical techniques, Sampling.
Identifiers: South Africa, Atomic absorption techniques.

With the growing interest in environmental pollution, the problems encountered in the storage and determination of mercury, present in water in ultra-trace concentrations, have received considerable attention. Atomic absorption, fluorescence and emission spectrometric methods of mercury analysis are reviewed, together with methods used to prevent mercury loss during sample storage. Reference is made to the use of an amalgamation technique as an alternative to solution storage. (South Africa)
W77-01442

THE EXPERIENCE WITH MONITORING WATER QUALITY IN WINDHOEK,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W77-01457

ENERGY DISPERSIVE X-RAY ANALYSIS (EDAX) AS AN AUTOPSY TECHNIQUE FOR COPPER-CAUSED FISH MORTALITY,
National Inst. for Water Research, Pretoria (South Africa).
Deryl J. Barlow, and W. S. G. Morgan.
Water S A, Vol 1 (3), p 109-112 (1975). 3 fig, 1 tab, 12 ref.

Descriptors: *X-Ray analysis, *Fishkill, Metals, Toxicity, Copper, Electron microscopy, Lethal limit, *Pollutant identification, *Mortality, Absorption.
Identifiers: South Africa, Fish tissue analysis.

Energy dispersive analysis of X-rays (EDAS) can be used to indicate acute copper toxicity in fish. Copper was absorbed from lethal concentrations of copper sulphate by gill and liver tissue. Small quantities of copper were also found in opercular bones. Furthermore, as a cause of mortality, copper could be detected up to 48 hours after death. It is probable that the technique is not specific for copper toxicity but may be used as a rapid means of detecting a number of metal ion toxicants in dead fish. (South Africa)
W77-01460

VIRUSES IN WATER, (VIRUSSE IN WATER), (IN AFRIKAANS),
Pretoria Univ. (South Africa). Dept. of Microbiology.
O. W. Prozesky.
Geneeskunde, Vol 17(8), p 162-165, (1975). 19 ref.

Descriptors: *Viruses, Public health, *Pollutant identification, Water quality standards, Ultrafiltration, Nutrients, Water reuse, *Bacteriophages.
Identifiers: South Africa, Herpes virus, Rota viruses, Hepatitis.

Discussed are the changing water environment, the presence of viruses in water, the determination of such viruses, the effect of water purification processes on viruses, problem viruses and the virological standards of water purity. (South Africa)
W77-01481

POLLUTION, MAN, HIS ENVIRONMENT AND THE PHYSICIST, (BESOEDELING, DIE MENS, SY OMGEWING EN DIE FISIKUS),
For primary bibliographic entry see Field 5G.
W77-01482

METAL ENRICHMENT OF SEDIMENTS IN INLAND WATERS - THE HARTBEESPOORT DAM,
Pretoria Univ. (South Africa). Dept. of Chemistry.
G. T. W. Wittmann, and U. Forstner.
Water SA., Vol 1 (2), p 76-82, (1975). 7 fig, 2 tab, 7 ref.

Descriptors: Water pollution, *Sediments, *Heavy metals, Dams, Sewage effluents, Industrial wastes, Water pollution sources, Impoundments, Indicators, Lake sediments, *Pollutant identification.
Identifiers: South Africa, Hartbeespoort Dam, Jukskei River, Crocodile River, Transvaal.

Analyses of the sediment fraction <2 microns has been shown to be a reliable indicator of heavy metal pollution in the water environment. Based on this premise, research has been conducted to establish the presence of heavy metals in the sediments of the Hartbeespoort Dam near Pretoria which receives purified domestic and industrial effluents via the Jukskei and Crocodile Rivers. It was found that heavy metal enrichment in the Hartbeespoort Dam sediments could be divided into two groups: Enrichment of the western zone of the dam with iron, chromium, cobalt and nickel which could be ascribed to the basic geological formations associated with the feeder streams discharging into this section of the dam; and enrichment of the south-eastern zone of the dam with zinc, lead, mercury and cadmium which could be ascribed to pollution from domestic and industrial sources entering the dam via the Crocodile River. It is shown how it is possible to distinguish between heavy metal enrichment of sediments derived from geological sources and from man-made pollution respectively. (South Africa)
W77-01487

COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES, VOL. III, ANNOTATED BIBLIOGRAPHY OF STATE DATA AND INFORMATION SOURCES,
Mitre Corp., McLean, Va.
E. Roberts.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 662, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, EPA 560/7-75-001-3, September 1975, 36 p., 1 tab., 12 ref.

Descriptors: *Bibliographies, *Basic data collections, *Arsenic compounds, *Beryllium, *Cadmium, *Chromium, *Lead, *Mercury, *Polychlorinated biphenyls, Information retrieval, On-site data collections, Information exchange, Monitoring, Public health, Toxicity, Pollutant identification.
Identifiers: *Arsenic, *Cyanide, *Toxic substances.

In June 1974, the Office of Toxic Substanc
EPA, contracted with MITRE to collect a
analyze toxic substances data in the U.S. In t
next 14 months MITRE contacted agencies in
key states and collected and analyzed their mo
toring data. This appendix is a cross-referer
bibliography by state and by substance of ev
body of data and report collected from the st
agencies in the course of the project. Substanc
of concern were arsenic, beryllium, cadmiu
chromium, lead, mercury, polychlorinated biph
yls. (Katz)
W77-01494

**ACUTE TOXICITY OF CHLORINE T
SELECTED ESTUARINE SPECIES,**
Virginia Inst. of Marine Sciences, Glouces
Point.
For primary bibliographic entry see Field 5C.
W77-01508

**THE DETERMINATION OF CADMIUM, LEA
COPPER AND ZINC IN GROUND WATE
ESTUARINE WATER, SEWAGE AND SEWA
EFFLUENT BY ANODIC STRIPPING VOLTA
METRY,**
Water Pollution Research Lab., Steven
(England).
J. Gardiner, and M. J. Stiff.
Water Research Vol. 9, No. 5/6, p 517-5
May/June 1975. 1 fig, 8 tab, 22 ref.

Descriptors: Water quality, *Water quality c
trol, *Trace elements, *Cadmium, *Le
*Copper, Water pollution, *Zinc, *Pollut
identification, Analytical techniques.
Identifiers: Anodic stripping voltammetry.

Anodic stripping voltammetry (ASV) using
thin-film mercury electrode was shown to b
successful technique for the determination of t
(free plus complexed) trace metal concentrati
in various types of aqueous sample. The met
developed involved the minimum of sample tr
ment and required only simple and inexpen
equipment. The practical limit of sensitivity
about 0.1 micro-g/l for cadmium, lead and cop
The determination of zinc was found to be c
plicated by the formation of an intermetallic c
pound with copper. Interference by other t
metals and by complexing agents was investiga
Photochemical oxidation for the decompositio
complexes of the metals with organic ligands in
tered sewage and sewage effluent was found t
successful, although the process is slower for c
mium than for the other metals. Good agreem
with atomic absorption spectroscopy was obta
for all the types of aqueous sample investiga
Possible improvements of the ASV technique
discussed. (Skogerboe-Colo St)
W77-01518

**A REVIEW OF THE POLLUTION ABATEM
SITUATION IN INDUSTRY, MUNICIPALIT
AND GOVERNMENT,**
Environmental Protection Agency, Washing
D. C. Office of Solid Waste Management
grams.
For primary bibliographic entry see Field 5G.
W77-01522

**INVESTIGATION OF REMOTE SENS
TECHNIQUES FOR AGRICULTU
FEEDLOT POLLUTION DETECTION,**
South Dakota State Univ., Brookings. Re
Sensing Inst.
F. A. Schmer, D. W. Ryland, and F. A. Waltz.
Project Completion Report SDSU-RSI-7
April, 1973, 166 p. 37 fig, 9 tab, 14 ref.

Descriptors: *Research and developm
*Remote sensing, *Feedlots, Water anal
*Pollutant identification, Water quality, F
wastes.
Identifiers: *Thermal imagery analysis.

s research effort was directed toward the appli-
on of remote sensing techniques to the detec-
and monitoring of pollution from cattle feed-
operations. Five livestock feeding operations
e selected for the study along the James River
n Huron to Redfield, South Dakota. Thirteen
al missions were flown from January 1, 1971
ugh June 30, 1972, providing aerial photog-
hy and thermal infrared data under various
ther conditions. Water samples were collected
ng nine of the aerial flights at fourteen river lo-
ons. Water samples were collected a minimum
very three weeks on a regular schedule to
w independent analysis of the water quality
. Data analysis consisted of visual interpreta-
of aerial photography and statistical analysis
film densities and water quality parameters.
lysis of variance and linear regression
niques were also utilized. In addition an at-
pt was made to adjust the film densities for
ations in incoming radiation. Results indicated
remote sensing techniques utilizing low and
altitude aircraft photography can be used to
te potential feedlot pollution sources. The
istical analysis showed good results for
cific aerial missions but considerable variabili-
vas noted between aerial flights indicating that
itional study is warranted. (East Central)
7-01533

. Sources Of Pollution

TURE CHEMICAL COMPOSITION OF THE EAT SALT LAKE BRINES,
gham Young Univ., Provo, Utah.
primary bibliographic entry see Field 2H.
7-01053

TRIBUTION AND SIGNIFICANCE OF CAL INDICATOR ORGANISMS IN THE PER CHESAPEAKE BAY,
ryland Univ., College Park. Dept. of crobiology.
primary bibliographic entry see Field 5C.
7-01061

EP WELL WASTES MAY BE WATER ZARDS.
ence News, Vol 109, p 295, May 8, 1976. 1 p.

scriptors: *Chemical wastes, *Underground ste disposal, *Injection wells, *Groundwater ources, *Underground storage, Water supply, page, Sewage disposal, Sewage treatment, lls, Underground streams, Aquifers, Subsur- e waters, Chemicals, Injection, Water ources.

e common notion that well injection liquids ain stable has come under attack from a recent dy done on wells in North Carolina. Whereas companies have been pumping brine into un- ground formations to force the oil to the sur- e without ill effects, there seem to be dangers olved in the injection of chemical wastes, and ecially of acetic wastes. Scientists found from ervation of 14 wells that the acids were quite table, that they caused clay minerals and iron des to dissolve from the acquifers and move ough underground formations, and that they sed re-precipitation forming a gel-like material ich plugged the pores of the acquifer. The team ng the study recommended that initial testing done on the chemicals before injection. thermore, where necessary, there should be treatment so that groundwater movement uld not pollute drinking water supplies. (Frank- rida)
7-01083

SLIME AND THE RIVER,
Graham.
dobon, Vol 77, p 9-15, March 1975. 7 p, 1 map, noto.

Descriptors: *Federal Water Pollution Control Act, Rivers, *River regulation, *Pulp wastes, *Pulp and paper industry, Water pollution, Industrial wastes, Wastes, Water pollution sources, Chemical wastes, Lumbering, Wood wastes, Forests, Bleaching wastes, Legal aspects, Water pollution treatment, Maine, New Hampshire.
Identifiers: *FWPCA Amendments of 1972, *Androscoggin River(NH-ME).

The Androscoggin River flows south through New Hampshire into Maine. The river begins in a sparkling pure condition at Umbagog Lake and flows some 90 miles before it runs by paper and pulp mills. Berlin, New Hampshire, is the site of a pulp mill that puts 3,500 gallons of waste sulfite liquor into the water for each ton of pulp produced. Berlin is also the site of 45 public sewers discharging untreated wastes into the Androscoggin while another twenty empty into a tributary, the Dead River. The river's future rests in part with how well the Federal Water Pollution Control Act amendments of 1972 withstand the current environmental slowdown. An extension has just been granted to the Brown Company Pulp Mill of Berlin that will permit unimpeded pollution for at least another year. Pollution treatment planta are presently being built by industry and town alike; however, it maybe 'too little, too late'. It is hoped that the possible inclusion of large stretches of the river under the protection of the National Wild and Scenic Rivers System might bring substantial improvement. (Frank-Florida)
W77-01084

TOTAL MINERAL DISSOLVED TRANSPORT BY WORLD MAJOR RIVERS,
Paris Univ., Orsay (France). Ecol Normale Superieure; and Paris Univ. (France). Laboratoire de Geologie.
M. Meybeck.
Hydrological Sciences Bulletin, Vol. 21, No. 2, p 265-284, June 1976. 3 fig, 3 tab, 77 ref.

Descriptors: *Rivers, *Ion transport, Mineral water, Hydrology, Water quality, Discharge, Runoff, Oceans, Equations, Topography, Climates, Path of pollutants.
Identifiers: *Mineral transport, *Dissolved transport, Ion content, Specific discharge, Solid transport data, Water mineralization, Ionic ratios, Hydrologic features, Water quality data.

World variations of dissolved transport (Td) and major ion content with runoff and solid transport (Ts) were examined on the basis of 40 of the world's biggest rivers. For each river, estimates of each of the above factors were given, and two subsamples were considered according to the size of the rivers. For each subsample it was found that major ion content was inversely related to runoff, and dissolved transport was directly related to runoff and to solid transport. The ratio Ts/Td was highly variable, but it generally increased when solid transport increased. Climate dominated major ion content variation, and relief dominated dissolved transport variation. Wide scatterings of major ion content and dissolved transport were due to the other factor - relief or climate respectively. On a world scale, relief was the main factor controlling variations of dissolved transport with solid transport. The direct relationship between dissolved transport and solid transport confirmed the work of Alekin and Brazhnikova in the USSR, while the inverse relationship found by Judson and Ritter in the conterminous United States seemed to be a minor trend due to the influence of climate surpassing relief. It was concluded that if chemical transport is a major factor on the earth's surface, the solid material carried by the rivers to the ocean as a whole is five times more than the dissolved transport on the basis of these 40 rivers. (Roberts-ISWS)
W77-01135

PERCOLATION OF SURFACE-APPLIED WATER IN THE FIELD,
Kentucky Agricultural Experimental Station, Lexington.
For primary bibliographic entry see Field 2G.
W77-01137

MODELING OF UNSTEADY TEMPERATURE DISTRIBUTION IN RIVERS WITH THERMAL DISCHARGES,
Purdue Univ. Lafayette, Ind. School of Mechanical Engineering. and Purdue Univ., Lafayette, Ind. Heat Transfer Lab.
R. G. Hills, and R. Viskanta.
Water Resources Research, Vol. 12, No. 4, p 712-722, August 1976. 20 fig, 29 ref.

Descriptors: *Heated water, *Thermal stratification, Analytical techniques, *Turbulent flow, *Mixing, Water temperature, Channel flow, Heat transfer, Radiation, Numerical analysis, Equations, Rivers, *Thermal pollution.
Identifiers: *Unsteady temperature distribution, Temperature distribution, Thermal discharge.

Unsteady temperature distribution was analyzed in a wide channel simulating a river. The effects of thermal discharges, meteorological conditions, solar and atmospheric radiation, and channel parameters on the thermal structure of a river were analyzed and discussed by utilizing an analytical model for the unsteady three-dimensional temperature distribution in the far field of a thermally stratified channel. The conservation of energy equation for turbulent flow was solved numerically with an alternating direction implicit finite difference scheme. The effects of thermal start-up, discharge temperature level, discharge location, river flow velocity, and other factors were investigated. The results showed that the greater the temperature excess above the ambient at the discharge, the greater downstream distance is needed to reach a fully mixed condition because of the suppressive effect of stratification on the turbulent mixing. The greater surface temperatures associated with thermally stratified flow resulted in increased heat dissipation and water evaporation from the surface. (Singh-ISWS)
W77-01144

NITRATE AND CHLORIDE POLLUTION OF AQUIFERS: A REGIONAL STUDY WITH THE AID OF A SINGLE-CELL MODEL,
Tahal-Water Planning for Israel, Ltd. Tel-Aviv.
A. Mercado.
Water Resources Research, Vol. 12, No. 4, p 731-747, August 1976. 15 fig, 6 tab, 7 ref.

Descriptors: *Nitrates, *Chlorides, *Water pollution, *Aquifers, *Mathematical models, Water pollution sources, Hydrologic properties, Zone of aeration, Water wells, Water table, Biochemistry, Groundwater, Tracers, Forecasting, Monte Carlo method, Probability, Statistical models, Tertiary treatment, Groundwater recharge, Equations.
Identifiers: *Israel, Single-cell model.

A single-cell model was used to study the regional chloride and nitrate pollution patterns in part of the coastal aquifer of Israel. The model integrated pollution sources on the land surface, hydrologic parameters of the aquifer and the unsaturated zone, and variations of chloride and nitrate concentration distribution in pumping wells. Complicated hydrologic and biochemical processes in the unsaturated zone were simplified and represented by two basic parameters: (1) transit time from land surface to the aquifer, and (2) nitrogen losses in the soil. It was shown that linear relationships exist between nitrogen quantities released on the surface and the quantities reaching the water table. The calibration of the model enabled its use for prediction purposes. The Monte Carlo technique was introduced to determine the range of predicted average groundwater concentrations as a function of time. The forecasts

presented call for urgent protection measures in order to meet drinking water standards for maximum nitrate concentrations. Thirteen alternative protection measures were examined and then compared to predictions based on present nitrogen loads and hydrologic regime. The exchange relationships between these measures were derived, and it was suggested that they can be used later for evaluating economic criteria for protecting groundwater quality. (Visocky-ISWS)
W77-01145

AN ANALYSIS OF SALINITY VARIATIONS WITHIN GREAT SOUTH BAY, NEW YORK,
Environmental Defense Fund, East Setauket, N. Y.
For primary bibliographic entry see Field 2L.
W77-01149

MODELING PHYTOPLANKTON BLOOMS IN A STRATIFIED EMBAYMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5C.
W77-01163

NON-POINT SOURCE CONTRIBUTIONS TO WATER QUALITY PROBLEMS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
E. A. McBean, and J. E. Gorrie.
In: Proceedings of the 10th Canadian Symposium 1975, Water Pollution Research Canada, p 142-150. 12 fig, 9 tab, 6 ref.

Descriptors: *Water pollution control, *Nitrogen, *Phosphorus, *Regression analysis, *Water quality, Drainage area, River basins, Sampling, Flow, Systems analysis, Path of pollutants.
Identifiers: *St. John River basin(New Brunswick, Canada), Mass flux, Instream flow, Multiple regression technique, *Non-point pollution sources.

Non-point source contributions of nitrogen and phosphorus are examined. A useful relation between nitrogen and phosphorus mass flux and instream flow is demonstrated to occur at a number of sampling locations situated on the Saint John River Basin. As well, through a multiple regression study, evidence is presented that argues that the variations in non-point source loadings observed from location to location are explainable in terms of the variations of relatively easily-measured parameters that describe the contributing areas. (Bell-Cornell)
W77-01173

THE MODELLING AND CONTROL OF POLLUTION IN A RIVER SYSTEM,
Cambridge Univ. (England). Dept. of Engineering.
P. Young, B. Beck, and M. Singh.
Journal of Hydrology, Vol. 28, No. 2/4, p 289-316, February 1976. (Published in Amsterdam) 7 fig, 24 ref.

Descriptors: *Water pollution control, *Mathematical models, *River systems, *Water quality, Dissolved oxygen, Biochemical oxygen demand, Effluents, Sewage, Design, Simulation analysis, Optimization, Equations, Systems analysis, Path of pollutants.

A river which is being used either as a source for potable supply or for recreation requires an adequate and, if possible, an automatic control system for maintaining pollution levels within reasonable bounds consistent both with the needs of the community and the requirements for maintaining a satisfactory ecological balance. This paper makes a preliminary examination of the design of such a system by considering the dynamic modeling and control of dissolved oxygen (DO) and biochemical oxygen demand (BOD) in a river system. This includes a discussion on the derivation and verification of simple DO-BOD models for a typical river, as well as initial thoughts on the operational control of sewage effluent discharges in order to maintain specified levels of dissolved oxygen in single and multiple reach river systems. (Bell-Cornell)
W77-01175

WATER QUALITY CONTROL UNDER UNCERTAINTY: OPTIMAL STOPPING RULES FOR SAMPLING,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 5G.
W77-01176

RADIONUCLIDES IN CHESAPEAKE BAY SEDIMENTS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2L.
W77-01188

WILDLIFE AND OIL SHALE, A PROBLEM ANALYSIS AND RESEARCH PROGRAM. VOLUME II, APPENDIX.
Thorne Ecological Inst., Boulder, Colo.
For primary bibliographic entry see Field 5C.
W77-01236

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS, CHLORINATED PARAFFINS,
Syracuse Univ. Research Corp., N.Y.
For primary bibliographic entry see Field 5C.
W77-01238

MINERAL REQUIREMENTS IN FISH--II. MAGNESIUM REQUIREMENT OF CARP,
Tokyo Univ. of Fisheries, 4, (Japan). Lab. of Fish Nutrition.
For primary bibliographic entry see Field 5C.
W77-01239

SPATIAL DISPERSION OF AN ESTUARINE BENTHIC FAUNAL COMMUNITY,
Swedish Water and Air Pollution Research Lab., Goteborg.
R. Rosenberg.
Journal of Experimental Marine Biology and Ecology, Vol. 15, p. 69-80, 1974. 3 fig., 4 tab., 15 ref.

Descriptors: *Biological communities, *Benthic fauna, *Benthos, *Biomass, *Spatial distribution, Population, Aquatic populations, Methodology, Distribution, Sampling, Bottom sampling, Crustaceans, Sediments, Water pollution effects, Environmental effects, *Estuarine environment.

By means of a box-sampler 20 moderately undisturbed sediment samples were obtained and subsampled. The fauna in the upper 0-5 cm of the sediments was compared to that in the 5-10 cm layer. Almost all species collected in both strata were found in the upper 0-5 cm about 64% of the individuals and 74% of the biomass were restricted to this upper layer. A sample area of 0.5 square meter (depth 0-10 cm) was found to be sufficient to make a quantitative evaluation of the benthic community. The horizontal dispersion of the macrobenthic community was studied using the variance/mean ratio and its dependence on sample size is discussed. The abundant species occurred in patches larger than 0.06 square meter and were correlated with aggregation. (Katz)
W77-01246

ORGANIC MATTER IN ATMOSPHERIC PRECIPITATION IN THE VORONEZH REGION, (IN RUSSIAN),
Voronezhskii Lesotekhnicheskii Institut (USSR).
I. M. Rozinoer, A. P. Saprykina, and S. M. Poroiskaya.
Gidrobiol Zh. 9(2), p 100-104, 1973.

Descriptors: *Rain water, *Organic matt *Measurement, Carbon compounds, Nitrog Snow, Acids, Amino acids microorganisn Precipitation(Atmospheric).
Identifiers: Esters, Fatty acids, Macrophyt USSR, *Voronezh region(USSR).

Organic matter in 10 samples of rain water and of water from snow obtained near the Voron River in Voronezh, USSR, were analyzed in sociation with the filling of the Voronezh Res voir by flood waters. The total content of orga matter determined by permanganate oxidizabil and nonvolatile C compounds was lower summer and spring rain water and higher in sn than in river water during the same period. T amount of N was 2-3 times higher in precipita water; this was evidently due to anthropoge factors. All 3 indices were higher in summer- rain than in snow. Volatile fatty acids occurred all the samples, varying from 4.8-7.4 micro equivalent/l for rain and 1.2-23.8 micro equivalent/l for snow. The higher amount volatile organic acids in river water was m pronounced in summer than in winter. In m samples no free amino acids were found. Increa in the content of amino acids in hydrolysates v linked to the breakdown of protein by microorg isms and macrophytes. Complex esters w found in the majority of rain water samples and almost all the snow samples. Tests made 18 from the city in an attempt to escape the effects pollution gave the same results.--Copyright 19 Biological Abstracts, Inc.
W77-01249

PCB CONTENTS IN MARINE ANIMALS CO LECTED IN THE EAST CHINA SEA, JAPANESE),
Hokkaido Univ., Sapporo (Japan). Lab. of Fo Hygiene.
For primary bibliographic entry see Field 5C.
W77-01255

THE ENVIRONMENTAL CHEMISTRY COPPER (II) IN AQUATIC SYSTEMS,
Australian Atomic Energy Commission Resea Establishment, Lucas Heights, Div. of Chemi Technology.
R. N. Sylva.
Water Research, Vol. 10, p. 789-792, 1976. 2 tab fig., 8 ref.

Descriptors: *Water pollution sources, *Copp *Metals, *Toxicity, *Adsorption, Chemist *Water chemistry, *Aquatic environme Laboratory tests, Analytical techniqu Hydrogen ion concentration, Hydrolysis.
Identifiers: *Copper ions.

The speciation of copper (II) in fresh water been examined by considering inorganic and ganic complexation and adsorption and precip tion processes. It is concluded that in most aqua systems these processes are capable of reduc free copper levels to very low values even in presence of high levels of total copper. (Katz)
W77-01257

MATHEMATICAL ANALYSIS OF THE CHE CAL SYSTEM 'CYANIDE-HEAVY METALS' THE WATER-DETERMINATION OF CO PONENTS AND TOXICITY OF THE SYSTEM THE THEORETICAL SOLUTION,
State Research Inst. of the Textile Industry, B (Czechoslovakia) Center for Research and App cation Ionized Radiation.
J. Blaha.
Water Research, Vol. 10, p. 815-819, 1976. 10 re

riptors: *Heavy metals, *Toxicity, *Water
istry, Mathematical studies, *Analytical
iques, *Mathematical models, *Toxins,
rogen ion concentration, Water quality.
tifiers: *Cyanide-heavy metals, *Cyanide
plexes.

athematical analysis of the chemical system
ide-heavy metals' in water is described. It al-
to determine the type, number, and concen-
n of the systems components to be com-
d. This mathematical analysis replaces chemi-
nalysis, both quantitative and qualitative. The
er is replaced by mathematical testing of the
ical properties of the system; the later is
ced by solution of the equations for calculat-
he components concentrations in the system.
also W77-01260) (Katz)
-01259

THEMATICAL ANALYSIS OF THE CHEMI-
SYSTEM 'CYANIDE-HEAVY METALS' IN
TER-DETERMINATION OF COMPONENTS
TOXICITY OF THE SYSTEM-II, SOLU-
N BY COMPUTER,
Textile Research Inst., Brno
choslovakia). Center for Research and Appli-
n Ionized Radiation.
aha.
er Research, Vol. 10, p. 821-828, 1976. 2 tab., 7

criptors: *Analytical techniques, *Toxicity,
mputer programs, *Water quality,
thematical models, Heavy metals, Compu-
Hydrogen ion concentration, Chemical pro-
es, Water properties.
tifiers: *Cyanide-heavy metal complexes.

constitutes Part Two of a paper dealing with
chemical system 'cyanide-heavy metals' in
r. A complete program in the programming
uage PL/I has been worked out and is
ented; it is applicable for practical IBM com-
r calculations of toxicity of the chemical
em. Proposition of a general analytical scheme
ivanced. (See also W77-01259) (Katz)
-01260

E ACCUMULATION OF PCB AS A FUNC-
N OF GROWTH IN JAPANESE ANCHOVY
GHT IN OSAKA BAY, (IN JAPANESE),
ka Prefectural Fisheries Experimental Station,
an).
primary bibliographic entry see Field 5C.
-01265

L NITRATE LOSS DURING IRRIGATION:
IANCEMENT BY PLANT ROOTS,
fornia Univ., Berkeley, Coll. of Natural
ources.
primary bibliographic entry see Field 3F.
-01268

VER GREEN BAY. AN EVALUATION OF
STING AND HISTORICAL CONDITIONS,
consin Dept. of Natural Resources, Madison.
primary bibliographic entry see Field 5C.
-01287

RKSHOP ON TOXICITY TO BIOTA OF
TAL FORMS IN NATURAL WATER.
rnational Joint Commission-United States and
ada.
primary bibliographic entry see Field 5C.
-01295

MPLEXATION OF METALS IN NATURAL
TER,
ada Centre for Inland Waters, Burlington
tario).
primary bibliographic entry see Field 5C.
-01296

DISTRIBUTION AND BIOACCUMULATION OF MERCURY IN BIOTIC AND ABIOTIC COMPARTMENTS OF A CONTAMINATED RIVER-RESERVOIR SYSTEM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W77-01297

ZINC SPECIATION AND TOXICITY TO FISHES,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-01298

STRUCTURE-ACTIVITY RELATIONS AND THE TOXICITY OF TRACE ELEMENTS TO AQUATIC BIOTA,
Atlantic Biological Station, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 5C.
W77-01299

METAL SPECIATION IN AQUATIC ENVIRONMENTS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5C.
W77-01300

PHARMACOKINETIC APPROACHES TO THE EVALUATION OF METHYLMERCURY IN FISH,
Michigan Univ., Ann Arbor. Public Health Toxicology Program.
For primary bibliographic entry see Field 5C.
W77-01301

MOLECULAR FORMS OF ARSENIC IN THE ENVIRONMENT,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-01302

THE MULTIPLE TOXICITY OF CERTAIN HEAVY METALS: ADDITIVE ACTIONS AND INTERACTIONS,
Concordia Univ., Montreal (Quebec). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-01303

TOXICITY RELATIONSHIPS TO COPPER FORMS IN NATURAL WATERS,
Environmental Research Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W77-01304

THE NEED TO ESTABLISH HEAVY METAL STANDARDS ON THE BASIS OF DISSOLVED METALS,
Colorado Div. of Wildlife, Fort Collins. Research Center.
For primary bibliographic entry see Field 5A.
W77-01305

ASPECTS OF HEAVY METALS TOXICITY IN FRESH WATERS,
Water Pollution Research Centre Stevenage (England).
For primary bibliographic entry see Field 5C.
W77-01306

COPPER TOXICITY TO PHYTOPLANKTON, AS AFFECTED BY ORGANIC LIGANDS, OTHER CATIONS AND INHERENT TOLERANCE OF ALGAE TO COPPER,
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5C.
W77-01307

POTENTIAL ROLES OF METAL-LIGANDS IN THE MARINE ENVIRONMENT,
Environmental Research Lab., Narragansett, R. I.
E. W. Davey.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p. 197-209, April 1976. 5 fig., 1 tab., 14 ref.

Descriptors: *Heavy metals, *Toxicity, *Sea water, *Analytical techniques, *Copper, Bioassay, Computer models, Measurement, Chelation, Organic matter, Marine algae, Detergents.
Identifiers: Computer model REDEQL II, Ligands, Thalassiosira pseudonana.

A bioassay technique that measures 0.003 M concentrations of EDTA in metal-ligand interactions, using the growth response of the oceanic diatom Thalassiosira pseudonana in artificial seawater, is described. At the equivalence point (point of maximum inflection of the signoid curve) the moles of copper added are equal to the moles of EDTA present in solution. The T. pseudonana copper bioassay could also be utilized as an endpoint detector for the quantitative measurement of copper binding capacity of seawater, and to quantitate natural organic chelators which might occur by using the methodology described. This bioassay is also applicable to semi-quantitation of the presence of natural or added synthetic chelators in the marine environment. The addition of synthetic chelators to oceanic waters could have three immediate ramifications. First, metals may become solubilized and transported from regions of high concentration to uncontaminated areas. Second, over-chelation of trace metals necessary for the growth of marine organisms, especially phytoplankton, is possible. Third, increased pathogenicity of marine waters could occur by the reduction of the 'natural' metal toxicity of seawater. Another potential predictive tool of metal-ligand interactions in seawater is the chemical computer model REDEQUL II, that includes equilibrium reactions between the major anions and cations in seawater. (See also W77-01295) (Auen-Wisconsin)
W77-01308

EFFECTS OF ORGANIC POLLUTANTS ON COPPER TOXICITY TO FISH,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 5C.
W77-01309

SYMPOSIUM ON STRUCTURE-ACTIVITY CORRELATIONS IN STUDIES OF TOXICITY AND BIOCONCENTRATION WITH AQUATIC ORGANISMS.
International Joint Commission-United States and Canada.
For primary bibliographic entry see Field 5C.
W77-01310

SURFACTANT STRUCTURE AND AQUATIC TOXICITY,
Monsanto Chemical Co., St. Louis, Mo.
For primary bibliographic entry see Field 5A.
W77-01311

PREDICTING A BIOCONCENTRATION POTENTIAL OF ORGANIC CHEMICALS IN FISH FROM PARTITION COEFFICIENTS,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 5C.
W77-01312

STRUCTURE-ACTIVITY RELATIONSHIPS IN FISH TOXICOLOGY,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W77-01313

STRUCTURE-ACTIVITY RELATIONSHIPS APPLIED,
Minnesota Univ., Duluth. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-01314

STRUCTURE-ACTIVITY RELATIONSHIPS OF DDT ANALOGS IN A NON-TARGET ORGANISM. LETHAL AND SUBLETHAL EFFECTS OF BROOK TROUT FINGERLINGS,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01315

MATHEMATICAL MODELS TO DESCRIBE THE TIME/SPACE DISTRIBUTION OF CHEMICALS IN A WATER SYSTEM,
Dow Chemical U.S.A., Midland, Mich. Functional Products and Systems.
W. B. Neely.
In: International Joint Commission Symposium on 'Structure-Activity Correlations in Studies of Toxicity and Bioconcentration with Aquatic Organisms,' March 11-13, 1975, Canada Center for Inland Waters, Burlington, Ontario, p. 261-269. 1 fig., 4 ref.

Descriptors: *Mathematical models, *Chemicals, Design, Temporal distribution, Spatial distribution, Toxicity, Pollutant identification, Food chains.
Identifiers: *Bioconcentration.

The chemical industry's use of mathematical models is to help the decision maker to interpret data, guide ongoing data collection efforts, and make predictions on future events. Another function of their models is to approximate an ecosystem so that perturbations by new inputs can be depicted and resulting consequences simulated. The underlying principle of a simulation is the decision as to what questions are asked and what information needs to be generated. Compartment models are generally used by the industry to resolve the problems of predicting the time/space distribution of chemicals and the relations that exist between the ecosystem components. The primary steps in model building consist of : (1) Explanation of bioconcentration, with pollution coefficients following as a natural extension; (2) distribution of a chemical in the ecosystem; and (3) space/time distribution posing the questions of how toxic is the material; what will the concentration profile look like downstream; where the nearest drinking water intake is; and how long the wave reaches that point. This discussion was illustrated by slides. (See also W77-01310) (Auen-Wisconsin)
W77-01317

AN APPROACH TO THE STUDY OF MULTIPLE TOXICITY,
Sir George Williams Univ., Montreal (Quebec). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-01318

BIOCONCENTRATION OF 14C-PESTICIDES BY BLUEGILL SUNFISH DURING CONTINUOUS AQUEOUS EXPOSURE,
Bionomics, Inc., Wareham, Mass.
For primary bibliographic entry see Field 5C.
W77-01320

CALCULATION OF PARTITION COEFFICIENTS USEFUL IN THE EVALUATION OF THE RELATIVE HAZARDS OF VARIOUS CHEMICALS IN THE ENVIRONMENT,
Pomona Coll. Claremont, Calif. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-01322

SALT STORAGE AND RUNOFF IN URBAN WATERSHED,
Utah State Univ., Logan. Watershed Science Unit; and Utah State Univ., Logan. Dept of Forestry and Outdoor Recreation.
R. H. Hawkins.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE4, Proceedings Paper 12292, p 737-743, August 1976. 3 fig, 3 tab, 9 ref, append.

Descriptors: *Chlorides, *Deicers, *Urban runoff, *Salts, *New York, Water quality, Low flow, Groundwater, Watersheds(Basins), Water pollution sources.
Identifiers: *Syracuse(NY), *Meadowbrook Watershed(NY).

Street salting studies in the Meadowbrook Watershed, Syracuse, New York were described. Over a 3 yr study period, 81.5% of the salts applied left the watershed in runoff waters. Considering the suburban nature of the basin, this was in consonance with results found elsewhere. Chloride concentrations in the low flow months of April-October were found to increase with time, suggesting that salt is accumulating in the local groundwater, which is a source of supply for these low flows. (Lardner-ISWS)
W77-01336

ENVIRONMENT POLLUTION BY ORGANOPHOSPHORUS COMPOUNDS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni I Toksikologii Pestitsidov, Kiev (USSR)
E. I. Spynu, L. N. Ivanova, and A. V. Bolotnyi.
Gig Sanit. 38(10), p 75-79, 1973.

Descriptors: Pesticides, Environment, Pollutants, *Organic pesticides, *Organophosphorus pesticides, *Reviews, *Water pollution, *Air pollution, *Soil contamination, Path of pollutants.

A review of the literature showed that the behavior of organophosphorus pesticides in the environment depends on many factors. The migration of these pesticides with the soil solution can lead to the formation of a pollution chain: soil-plant and soil-water. Four groups of factors determining the level and persistence of pesticides in individual media and processes of their migration are distinguished: the physicochemical properties of the pesticides, characteristics of the medium (soil, plant, water, air), conditions of applying the pesticides, and climatic and geographic characteristics of individual regions where the pesticides are used.--Copyright 1975, Biological Abstracts, Inc.
W77-01352

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1971-SEPTEMBER 1973,
Geological Survey, Austin, Tex.
K. W. Ratzlaff.
Texas Water Development Board Report 208, June 1976. 348 p, 13 fig, 10 tab, 6 ref.

Descriptors: *Water quality, *Path of pollutants, *Estuaries, *Gulf of Mexico, *Texas, Basic data collections, Water analysis, Chemical analysis, Sampling, Physicochemical properties, Biological properties, Nutrients, Heavy metals, Tidal effects.

This report, fifth in an annual series of basic-d reports, presents data collected during water ye 1972 and 1973 in the estuaries of Texas. The obj tives of the investigation are to define: (1) The currence, source, and distribution of nutrients; the physical, organic, and inorganic water-qual constituents and their areal distribution and ti variations; (3) the chemical and physical char teristics of Gulf water that enters the estuaries; the occurrence, quality, quantity, and dispers of drainage entering the estuarine systems; and the current patterns, directions, and rates of wa movement. Approximately 400 data-collect sites were visited yearly during water years 1 and 1973. (Woodard-USGS)
W77-01416

THE RELATIONSHIP BETWEEN NITRA CONCENTRATIONS IN THE SOUTHERN A PALACHIAN MOUNTAIN STREAMS AND TE RESTRIAL NITRIFIERS,
Forest Service (USDA), Franklin, N.C. Cowe Hydrologic Lab.
R. L. Todd, W. T. Swank, J. E. Douglass, P. C. Kerr, and D. L. Brockway.
Agro-Ecosystems, Vol 2, p 127-132, 1975. 3 fi tab, 11 ref

Descriptors: *Nitrates, *Nitrification, *Nitro fixing bacteria, Streamflow, *Appalachian Mo tain Region, Southeast US, Streams, Nitrog Watersheds(Basins), Path of pollutants.
Identifiers: Southern Appalachians rep Nitrate nitrogen.

The nitrate content of stream water and the nitr ing bacterial population of the terrestrial hori were measured in three southern Appalach watersheds over a 22-month period. watersheds studied were a fescue g catchment, a 15-year old white pine plantati and a mature undisturbed hardwood for Monthly averages of nitrate-nitrogen in stre water from the three watersheds were 730, and 3 ppb respectively, the respective nitrify populations averaged 16,000, 175 and 22 per g of dry weight for each 40 cm soil profile. Th populations were concentrated in the upper 10 of the profile (grass = 98%, white pine = 90%, hardwood = 88%). A correlation is evi between the number of nitrifying bacteria in soil from gaged watersheds and the NO3 con of the streams. Nitrifying activity appears to dependent on vegetation type and successi stage. (Forest Service)
W77-01423

METHANE, CARBON DIOXIDE, AND I SOLVED SULFATE FROM INTERSTIT WATER OF COASTAL MARSH SEDIMENTS
Louisiana State Univ., Baton Rouge. Coastal dies Inst.
T. Whelan.
Available from the National Technical Infor tion Service, Springfield, VA 22161 as AD-A 795, Price codes: A02 in paper copy, A0 microfiche. Estuarine and Coastal Ma Science, (1974) 2, p. 407-415, 2 tab., 4 fig., 16 re

Descriptors: *Carbon cycle, *Carbon diox Gases, *Sediments, *Methane, *Louisi *Coastal marshes, Tidal marshes, Muck s Swamp, Chlorides, Sulfates, Salinity, *Meth bacteria.
Identifiers: Marsh sediment, South Louisiana.

The depth distributions of dissolved meth total carbon dioxide, chloride, and sulfate i terstitial waters are reported from three environments in the coastal marsh sediment south Louisiana. Dissolved methane ranged f 8.0 x 10-3 to 7.2 ml/l, with each core demonstra a slight increase in concentration with depth. highest concentrations of methane were obse in the northern subenvironment of the ma which was low in salinity. Extraction u

ım of methane from whole sediment samples ated that a significant amount of gas is nt as bubbles. Total carbon dioxide ranges 110 to 410 ml/l. Carbon dioxide, extracted r vacuum, yielded carbon isotope ratio values 8.9 and -22.5 o/oo for the southern and ern areas, respectively. The total carbon de concentration in two areas was greater or equal to that predicted by the depletion of lved sulfate from microbial reduction esses. In one core, however, the total carbon de concentration was less than could be ac- ted for by the sulfate deficit. In general, e sulfate reduction was active or where the lved sulfate concentration was low, the con- ation of methane increased. (Katz)
01495

ICITY OF 30-MINUTE EXPOSURES OF DUAL CHLORINE TO THE COPEPODS NOCALANUS MACRURUS AND CYCLOPS SPIDATUS THOMASI,
onsin Univ., Milwaukee. Center for Great s Studies.
rimary bibliographic entry see Field 5C.
-01507

CIFIC ADSORPTION OF TRACE OUNTS OF CALCIUM AND STRONTIUM HYDROUS OXIDES OF IRON AND ALU- UM,
ey Univ., Palmerston North (New Zealand). . of Soil Science.
rimary bibliographic entry see Field 2G.
-01513

MONIA VOLATILIZATION FROM SUR- E APPLICATIONS OF AMMONIUM COM- NDS ON CALCAREOUS SOILS: IV. EF- T OF CALCIUM CARBONATE CONTENT,
s A and M Univ., El Paso. Agricultureal arch Station.
rimary bibliographic entry see Field 2G.
-01515

IVENTIONAL AND CONTROLLED- EASE NITROGEN SOURCES FOR RICE,
nsas Agricultural Experiment Station, Stutt- Rice Branch Experiment Station.
primary bibliographic entry see Field 3F.
-01516

POSED ANIMAL WASTE REGULATIONS WISCONSIN,
consin Univ., Madison. Dept. of Soil Science.
primary bibliographic entry see Field 5G.
-01526

RY MANURE UTILIZATION AND FIELD LICATION RATES,
Meyer, R. S. Rauschkolb, and E. Olson.
6). 14 p. 3 fig, 3 tab, 9 ref.

criptors: *Salts, *Nitrogen, *Crop response, trients, Liquid wastes, Solid wastes, Soil ile, Leaching, Denitrification, *Farm wastes. tifiers: *Dairy manure, Volatilization.

m concerning nutrient and other salt move- t in soils and their possible entry into water olies has caused researchers to examine dairy ure management practices. It has been found in storing solid wastes, deep percolation es of nutrients and salts can be prevented by disturbing the bottom of the pack. Also, liquid te storage ponds have been found to be self- ing. Both liquid and solid dairy wastes have n found to be beneficial when applied to crops. key to conserving nitrogen applied to the olands is to incorporate it into the soil as soon ossible in order to prevent denitrification or hing. Factors affecting nitrogen availability and conservation include: amount of nitrogen released for plant use, method of application, handling, storage between collection and use and rate of application. Excessive nitrogen from organic or inorganic sources may be leached to the water table. Improved manure management with less nitrogen loss will mean fewer total salts added to the soil, since less manure will be needed to meet the nitrogen requirements of crops. (Penrod-East Central)
W77-01532

INVESTIGATION OF REMOTE SENSING TECHNIQUES FOR AGRICULTURAL FEEDLOT POLLUTION DETECTION,
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 5A.
W77-01533

DISPOSAL OF BEEF FEEDLOT MANURE,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 5E.
W77-01536

WATER QUALITY AND MANAGEMENT CHARACTERISTICS OF FEEDLOT RUNOFF HOLDING PONDS,
Illinois Univ., at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-01537

INTERACTIONS OF BEEF CATTLE WASTES WITH SOIL,
F. A. Norstadt, and L. K. Porter.
In: Environmental Biogeochemistry, Vol. 2, Chapter 47, Ann Arbor Science, Ann Arbor, Michigan, p. 763-775, 1976. 4 fig, 7 tab, 8 ref.

Descriptors: *Soil profiles, *Cattle, *Feed lots, *Sampling, Groundwater, *Farm wastes, Water pollution sources.
Identifiers: *Manure pack, *Soil water tensions, *Soil temperature, *Soil gases.

A soil core study was conducted at a commercial feedlot in Fort Collins, Colorado in 1972. The soil was a silty-clay loam with a water table varying between 240 and 360 cm, according to season and irrigation scheduling of adjacent cropland. Two metal cylinders or caissons were installed to a depth of 450 cm in a nearly square pen. One was located two meters from the feedbunk concrete apron (area receiving the most animal traffic, urine and feces) and the other in the center, about 30 m away from the bunk caisson (area of less traffic and excretion.) A third caisson was located in a nearby alfalfa field for comparison. The lot was usually stocked at 30 m2 per animal. The caissons monitored five depths (15, 60, 90, 180, and 270 cm) for soil water tensions and soil temperatures and permitted sampling of soil gases and soil solutions. Study results indicated that differences in animal traffic and excretion distribution in the feedlot caused 2 distinct soil regions to develop -- one aerobic, and one anaerobic. The former was near the center of the lot, and the latter was along the concrete apron in front of the feedbunk. Essentially the feedlot surface was sealed and little if any water infiltrated and percolated. Soil water tensions were stable during the year in the upper feedlot soil profile as compared to alfalfa field. The composition of soil gases differed markedly among the 3 caisson sites. It was found that the soil and micro-organisms responded with interesting reactions not easily observed in cultivated soils. The authors concluded that a northeastern Colorado feedlot, stocked and managed as reported in the study, does not appear to be a hazard to soil and groundwater. (Penrod-East Central)
W77-01539

GROUND-WATER CONTAMINATION BY DISSOLVED NITRATE,
Missouri Univ., Columbia. Dept. of Geology.
W. D. Keller, and G. E. Smith.
Presented at 164th Meeting of Geological Society of America, Miami, Florida, 27 p. 3 fig, 3 tab.

Descriptors: *Nitrates, *Fertilizers, Geochemistry, *Missouri, Surveys, *Farm wastes, *Groundwater, *Water pollution sources, Dissolved solids.

This report is concerned with a brief comment on the geochemistry of the NO3 ion and a progress survey of high-nitrate subsurface water in Missouri. Nitrates in Missouri subsurface waters were investigated by collecting water from wells and springs. More than 5,000 water samples were collected and analyzed. Approximately 42 percent of the samples ranging from 12 to 75 percent of the samples from individual counties, contained over 5 ppm nitrogen. The dominant source of water-pollutant nitrate in Missouri water table was found to be nitrogenous waste material from farm feed lots. Heavy application of nitrate fertilizers on highly permeable, alluvial soils, may contribute to the nitrate content of water table wells. (Cartmell-East Central)
W77-01542

A HANDBOOK FOR ESTIMATING THE POLLUTION POTENTIAL OF BEEF, DAIRY, SHEEP AND SWINE FEEDLOTS IN THE NORTH CENTRAL REGION,
R. L. Mensch.
Project Report for Consulting Work Performed for the Farm Structures Division, Agricultural Engineering Department, University of Illinois, Urbana, June, 1971, 29 p. 18 fig.

Descriptors: *Feed lots, *Livestock, *Agricultural runoff, Cattle, Dairy industry, Sheep, Hogs, Climatic data, *Farm wastes, Water pollution.
Identifiers: *North Central U.S., *Pollution potential.

The primary objectives in preparing this handbook are: (1) present procedures so that non-engineers can make on-site evaluation of a feedlot's pollution potential, (2) simplify mathematics so they can be performed without a computer or slide rule, and (3) reduce the number of instruments needed in securing field data to a minimum. A literature review was conducted to pull together the various procedures and equations of evaluating a feedlot's pollution potential in order to provide a continuous evaluation of the system, going from one component to the next. Selected references are cited. Evaluation of a feedlot must include climatic data as well as other factors such as: number of animals, type of animals, ration, percentage of time during the year that the feedlot is in use, feedlot area, lot slope and slope length, and feedlot management. All factors are compiled into a two page worksheet for the computation of feedlot runoff pollution. (Penrod-East Central)
W77-01543

LAND SPREADING OF MANURE FROM ANIMAL PRODUCTION UNITS,
Newcastle-upon-Tyne Univ. (England). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W77-01544

5C. Effects Of Pollution

TEMPERATURE VARIATION IN FIDDLER CRAB MICROHABITATS,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
L. W. Powers, and J. F. Cole.
Journal of Experimental Marine Biology and Ecology, Vol. 21, 1976, p 141-157, 7 fig, 4 tab, 26 ref.

Descriptors: Environmental effects, *Temperature, Behavior, *Crabs, Microenvironment, Adaptation, *Texas, Resistance, Water pollution effects, Lethal limit.
Identifiers: *Fiddler crabs, Uca panacea, Uca virens.

Data obtained from measurements of the thermal environment at the microhabitat level were used to evaluate seasonal, diel, and spatial patterns of activity of non-tidal fiddler crabs (Uca panacea and Uca virens). The crabs occupy a variety of microhabitats and were active at times during which thermal conditions were not extreme. Wider ranges of temperature and humidity were tolerated during the summer courtship display season. Nocturnal activity was possible during the winter because the heat wave arrives at the burrow terminus several hours after surface maximum. When low temperatures prevail night and day, the crabs remain inactive by day and night. Summer temperatures were high enough to permit activity by day and night. When summer temperatures were above the upper lethal limits, crabs limited their activities to morning and evening periods. (Chilton-ORNL)
W77-01058

NITROGEN FIXATION IN THE RHODE RIVER ESTUARY OF CHESAPEAKE BAY,
Maryland Univ. Baltimore County, Baltimore. Dept. of Biological Sciences.
T. V. Marsho, R. P. Burchard, and R. Fleming.
Canadian Journal of Microbiology, Vol. 21, No. 9, 1975, p 1348-1356, 5 fig, 2 tab, 23 ref.

Descriptors: *Laboratory tests, *Nitrogen fixation, *Estuaries, Sediments, Intertidal areas, Bacteria, *Chesapeake Bay, Plant growth, Water pollution effects, *Bioassay, Eutrophication.
Identifiers: Heterotrophic bacteria.

The reduction of acetylene to ethylene was used as an assay for determining the capacity of biological systems to fix molecular nitrogen in a Chesapeake Bay estuary. Studies conducted over a 15 month period showed that nitrogen fixation occurs predominantly in the surface intertidal and subtidal sediments. Seasonal variation in nitrogen fixation was found for intertidal sediments incubated at 20 C. Average rates of approximately 37 and 12 ng N/g dry sediment per hour were observed in late fall months of 1972 and 1973, and less than or equal to 5 ng N/g dry sediment/hour during other seasons. Incubation of samples at ambient temperatures resulted in lowered peaks of activity. Light-dark and substrate experiments suggested that heterotrophic bacteria were the principal agents for nitrogen fixation in sediments. Seasonal burst of nitrogen fixation potential was out of phase with the period of rapid plant growth. (Chilton-ORNL)
W77-01059

TEMPERATURE AND THE VERTICAL DISTRIBUTION OF TWO TIDEPOOL FISHES (OLIGOCOTTUS MACULOSUS, O. SNYDERI),
Southeastern Massachusetts Univ., North Dartmouth. Dept. of Biology.
R. Nakamura.
Copeia, No. 1, 1976, p 143-152, 4 tab, 6 fig, 34 ref.

Descriptors: Environmental effects, *Temperature, *Distribution, Distribution patterns, Fish, Fish behavior, Tides, Intertidal areas, Estuaries, On-site investigations, *Sculpins, Water pollution effects.
Identifiers: *Oligocottus maculosus, *Oligocottus snyderi.

The relationship between tide cycle, microhabitat, temperatures, microdistribution patterns and thermal physiology of Oligocottus maculosus and Oligocottus snyderi was studied. Temperature was found to vary greatly in tidepools with the magnitude of the variations being governed by the tide cycle and varying according to vertical position, time of day, and season. Distributional differences of the two species studied within the intertidal zone appeared to be mainly due to tidepool temperature regimes. The distribution of O. maculosus was ubiquitous in the intertidal zone while that of O. snyderi was restricted entirely to the lower intertidal zone where temperature regimes were cooler and more stable. (Chilton-ORNL)
W77-01060

DISTRIBUTION AND SIGNIFICANCE OF FECAL INDICATOR ORGANISMS IN THE UPPER CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
G. S. Saylor, J. D. Nelson, Jr., A. Justice, and R. R. Colwill.
Applied Microbiology, Vol. 30, No. 4, October 1975, p 625-638, 7 tab, 8 fig, 13 ref.

Descriptors: *Water pollution effects, *Water quality, Waste water(Pollution), Domestic wastes, Sewage, Environmental effects, Shellfish, Recreation, Temperature, Salinity, Bays, *Chesapeake Bay, *Bioindicators, *Distribution, Coliforms, Bacteria, Enteric bacteria, Streptococcus, Aerobic bacteria.
Identifiers: Heterotrophic bacteria.

The survey reported upon provides evidence of significant levels of pollution from human wastes in the water, sediment, and suspended sediment throughout the Upper Chesapeake Bay. Highest counts of pollution indicator organisms were found at the confluence of the Susquehanna River and the Chesapeake Bay. Organisms were found to be quantitatively distributed independently of temperature and salinity and were not correlated with concentration of suspended sediment. However, 53% of total viable bacteria and more than 80% of fecal indicator organisms were directly associated with suspended sediments. Correlation coefficients for the indicator organisms ranged from 0.80 for bottom water to 0.99 for suspended sediment. Prolonged survival for the fecal streptocci was seen in most of the sediment samples. Further deterioration in water quality would seriously affect shellfish harvesting and recreational uses of the Upper Chesapeake Bay. (Chilton-ORNL)
W77-01061

HYDROGEN ION CONCENTRATION IN THE GASTROINTESTINAL TRACT OF CHANNEL CATFISH,
Georgia Agricultural Experiment Station, Savannah.
J. W. Page, J. W. Andrews, T. Murai, and M. W. Murray.
Journal of Fish Biology, Vol. 8, 1976, p 225-228, 2 tab, 8 ref.

Descriptors: Biochemistry *Aquatic animals, Fish, *Hydrogen ion concentration, Laboratory investigations, Temperature, *Channel catfish, Water pollution effects.
Identifiers: Gastrointestinal tract(Catfish).

Two groups of five channel catfish, with average weights of 892 and 134 g, were maintained at environmental temperatures of 23 and 28C. Highly acidic conditions were present in the stomachs of all fish with slightly higher pH values for the stomach contents of fish at 28C. The pH values increased to 7-9 in the duodenum and reached a maximum level of 8.6 in the upper intestinal region with a decrease approaching neutrality in the lower segments of the colon. Catfish of both sizes had a slightly lower pH throughout the intestinal tract at 28C than at 23C. The pH of the bile ranged from 6.1 to 7.5 and was higher in fish maintained at 28C. (Chilton-ORNL)
W77-01062

SEASONAL SHIFTS IN THE SPAWNING S OF A NORTHEAST PACIFIC INTERTI FISH,
British Columbia Univ., Vancouver, B. C. Ins Animal Resource Ecology.
For primary bibliographic entry see Field 2L.
W77-01063

SEASONAL DISTRIBUTIONS OF LAR FLATFISHES (PLEURONECTIFORMES) THE CONTINENTAL SHELF BETWEEN C COD, MASSACHUSETTS, AND C LOOKOUT, NORTH CAROLINA, 1965-66,
National Marine Fisheries Service, Highlands J. Sandy Hook Lab.; and National Marine Fi ries Service, Highlands, N. J. Middle Atl Coastal Fisheries Center.
For primary bibliographic entry see Field 2L.
W77-01064

MIXED FUNCTION MONOOXYGENASE FISH AS AN INDICATOR OF POLLUTION AQUATIC ENVIRONMENT BY INDUSTR EFFLUENT,
Oulu Univ. (Finland). Dept. of Pharmacology.
J. T. Ahokas, N. T. Karki, A. Oikari, and A. Soivio.
Bulletin of Environmental Contamination Toxicology, Vol. 16, No. 3, 1976, p 270-274, 1 18 ref.

Descriptors: Environmental effects, Water p tion, *Water pollution effects, W water(Pollution), Wastes, Industrial wastes, I Aquatic environment, Enzymes, Pollutant ide cation, *Bioindicators, *Metabolism, *Pikes.
Identifiers: *Monooxygenase.

The pike (Esox lucius L.) was used to deter whether or not fish in polluted water have a hi in vitro capacity to metabolize foreign compo than those in clean water. The overall trend, trary to what had been previously reported, that the fish from the polluted water show reduced in vitro mixed function monooxyge (MFO) capacity. Preliminary exposure studi which two other species of fish (Salmo t lacustris and Salmo gairdneri) were exposed t polluted water on one and four week periods not develop changes such as those seen in chronically exposed to the contaminated wa (Chilton-ORNL)
W77-01065

TOXICITY OF ENDRIN AND AN END METHYL PARATHION FORMULATION LARGEMOUTH BASS FINGERLINGS,
North Carolina State Univ., Raleigh. Toxico Lab.; and North Carolina State Univ. Dept. o tomology.
D. L. Fabacher.
Bulletin of Environmental Contamination Toxicology, Vol. 16, No. 3, 1976, p 376-378, 2 3 ref.

Descriptors: Environmental effects, Pestic Fish, *Bass, Fry, *Toxicity, Mortality, *En Water pollution effects, Pesticide residues, L limit.
Identifiers: *Methyl parathion, LC50.

The purpose was to determine the exact toxici endrin and a 1.6-1.6 lbs/gal. endrin-m parathion formulation to largemouth bass gerlings and to determine if the toxicity of the mulation was different from that of endrin a The 24 and 48 hour LC50 values for endrin 0.49 and 0.27 ppb respectively. The 24 and 48 LC50 values of the endrin-methyl parathion mulation were 0.48 and 0.37 ppb respecti (Chilton-ORNL)
W77-01066

ACROPHYTIC ALGAE OF THE VOSTOK AY (SEA OF JAPAN), (IN RUSSIAN),
kademiya Nauk SSSR, Vladivostok. Institut orskogo Biologii.
F. Makienko.
ol Morya Vladivost 2, p 45-57, 1975.

escriptors: *Algae, *Bays, Chlorophyta, aeophyta, Reproduction, Rhodophyta, asonal, Tides, Intertidal area.
entifiers: *Macrophytic algae, *Sea of Japan, ostok Bay(USSR).

e species composition and vertical distribution macrophytes algae from Vostok Bay (the Sea of pan, Vostok station (USSR) were studied. egetation periods and reproductive seasons were o studied. Alga species including Chlorophyta, aeophyta and Rhodophyta (19,35 and 66, spectively) were found in the region. The richest ecies diversity was observed in the intertidal ne. Algal distribution in the bay is shown on a hematic map. Vegetation and reproduction asons are illustrated by a table.--Copyright 1976, ological Abstracts, Inc.
77-01142

ODELING PHYTOPLANKTON BLOOMS IN A RATIFIED EMBAYMENT,
tah Water Research Lab., Logan.
. J. Grenney.
ccasional Paper 8, June 1975. 24 p, 5 fig, 41 ref.

escriptors: *Phytoplankton, *Mathematical odels, *Simulation analysis, *Water quality, ydrodynamics, *Ecosystems, Nitrogen, utrients, Storage, Light intensity, Temperature, nvironment, Convection, Dispersion, Equations, ystems analysis, Growth rates, *Eutrophication, ater pollution effects.
entifiers: Auke Bay(Alaska), Biological models.

mathematical model has been developed to mulate the nitrogen limited growth dynamics of ytoplankton in a stratified embayment. The presentation of biological growth dynamics in udes consideration of intracellular nutrient orage as well as the effects of temperature and ght intensity. Several competing species can be presented simultaneously. Model hydrodynam s represent the effects of vertical mixing in the ater column on the physical distribution of utrients and phytoplankton. Sinking velocities of e cells are also included. The model was applied Auke Bay, Alaska, and model responses are mpared to data observed during the spring and mmer of 1967. The model indicates that ytoplankton populations decrease rapidly with creasing sinking velocity. In conclusion, cosystems present unique problems for quantita ve description and prediction. Mathematical odels, although less than perfect, can be power l tools for analyzing these systems. An optimal alance between accuracy and practicability must e sought. (Bell-Cornell)
77-01163

OMPOSITION OF THE CARBOHYDRATE OMPLEX OF APHANIZOMENON FLOS-QUAE (L.) RALFS, (IN RUSSIAN),
kademiya Nauk URSR, Kiev. Instytut Botaniki.
. A. Shnyukova, and S. U. Pirozhenko.
idrobiol Zh 11(1), p 91-95, 1975.

escriptors: *Carbohydrates, Cellulose, Eutrophication, *Algae, Aquatic plants.
dentifiers: *Aphanizomenon-Flos-Aquae, Pectin, accharides.

he peak of bloom of a water body caused by the evelopment of a monoculture of A. flos-aquae as accompanied by a increase of the total content f carbohydrates in their cells, mainly due to olysaccharides of the hemicellulose, pectin and ellulose type. A decrease of bloom was attended y a decrease of total carbohydrates. The polysaccharides of A. flos-aquae are distinguished by a large set of monosaccharides. Ten components were established in their hydrolysate.--Copyright 1976, Biological Abstracts, Inc.
W77-01209

KEPONE: HAZARD TO AQUATIC ORGANISMS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
D. J. Hansen, A. J. Wilson, W. R. Nimmo, S. C. Schimmel, and L. H. Bahner.
Science, Vol 193, No 4253, 13 August 1976. p 528. Letter to the editor.

Descriptors: *Pesticides, *Toxicity, *Mortality, *Bioassay, *Halogenated pesticides, *Freshwater fish, *Estuarine fish, *Commercial fish, Organic pesticides, Minnows, Crabs, Fish reproduction, Spawning, Fecundity, Estuarine pollution, Path of pollutants, Chesapeake Bay.
Identifiers: *Kepone, James River(Va), Bioconcentration, Sheepshead minnows, Grass shrimp, Mysids, Bioaccumulation.

Edible tissues of most estuarine and freshwater fish and invertebrates ranged from 0.1 to more than one microgram per gram. Oysters, grass shrimp and fish concentrated Kepone from 425 to 20,000 times the concentration in the surrounding water. Ninety-six hour LC-50 for Kepone for fish and invertebrates varied from 6.6 to 210 micrograms per liter. Twenty-eight day bioassays indicated mortalities at 0.8 micrograms per liter. Reproduction of fish was affected at 0.08 micrograms of Kepone per liter. (Katz)
W77-01235

WILDLIFE AND OIL SHALE, A PROBLEM ANALYSIS AND RESEARCH PROGRAM. VOLUME II, APPENDIX.
Thorne Ecological Inst., Boulder, Colo.
Fish and Wildlife Service, (Washington, D.C.). Office of Biological Services, 1975. 131 p. Coordinated by H. D. Burke.

Descriptors: *Ecosystems, *Biological communities, *Food chains, *Biota, *Water quality, *Mineral industry, *Mine wastes, *Mining, Niches, Environmental gradient, Industrial wastes, Industrial water, Amphibians, Reptiles, Aquatic animals, Public health, Wildlife, *Bibliographies.
Identifiers: *Oil shale mining, *Oil shale production, *Disease vectors, Blood sucking arthropods.

This bibliography is a collection of 1,045 references that deal with aquatic ecosystems, water quality, terrestrial ecosystems, industrial impacts on wildlife, reptiles and amphibians, blood sucking arthropods and disease vectors. These references will be useful in the description of the region involved in oil shale production and it's environmental processes. (Katz)
W77-01236

THE EFFECTS OF THERMAL EFFLUENT ON THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA GMELIN IN INDIAN RIVER BAY, DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
J. Tinsman, and D. Maurer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 410, Price codes: A06 in paper copy, A01 in microfiche. July 1976, 114 p, 8 tab, 14 fig, 148 ref.

Descriptors: *Thermal stress, Thermal water, *Thermal pollution, Thermal power, *Thermal power plants, *Oysters, Mollusca, Effluents, *Estuaries, *Estuarine environment, Estuarine fisheries, *Industrial wastes, Growth rates, Reproduction, Seasonal, *Delaware, Bays.
Identifiers: *Indian River Bay(Delaware), Glycogen content, *Crassostrea virginica, *Oyster growth, Meat weight.

This report was undertaken in order to determine some of the effects of the thermal discharge from the Delaware Power and Light Company plant at Millsboro, Delaware, on the American oyster, Crassostrea virginica (Gmelin), placed in Indian River Bay. The objectives of the project were to trace the survivorship, growth, condition, and reproductive behavior of oysters held in the thermal effluent and at control stations. The samples were taken from August 1970 to May 1971. The heated effluent had the effect of shortening and modifying the severity of the winter, thereby increasing the growing season. Oysters in the effluent showed the greatest shell growth throughout the study. Meat weights and glycogen concentration in the effluent were highest of all the stations in the winter. Summer conditions in the effluent were severe due to excessively high temperatures and meat weights and glycogen concentrations were lower than at other stations. In the spring, spawning may have occurred prematurely in the effluent at station two, which was located 2.5 km downstream at the mouth of the effluent canal. The study showed that the thermal effluent has both beneficial and detrimental effects depending on the season. (Katz)
W77-01237

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS, CHLORINATED PARAFFINS,
Syracuse Univ. Research Corp., N.Y.
P. H. Howard, J. Santodonato, and S. J. Saxena.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 634, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, EPA 560/2-75-007, TR 75-622, November 1975. 109 p, 36 tab, 3 fig, 111 ref.

Descriptors: *Organic compounds, *Chlorinated hydrocarbons, *Chemicals, *Toxicity, Environmental control, Pathology, Analytical techniques, Human diseases, Human pathology, Plants, Microorganisms, Bioassays, Oil industry, Environmental effects, Public health.
Identifiers: Environmental contaminants, *Chlorinated paraffins, Chlorowax, Oil additives, Plasticizers, Flame retardants.

This report reviews the potential environmental hazard from the commercial use of chlorinated paraffins. Chlorinated paraffins, in most cases, contain 10 to 30 carbon atoms and a chlorine content of 40-70%. They are used as lubricating oil additives, secondary plasticizers, and flame retardants. Information on physical and chemical properties, production methods and quantities, commercial uses and factors affecting environmental contamination, as well as information related to health and biological effects, are reviewed. (Katz)
W77-01238

MINERAL REQUIREMENTS IN FISH--II. MAGNESIUM REQUIREMENT OF CARP,
Tokyo Univ. of Fisheries, 4, (Japan). Lab. of Fish Nutrition.
C. Ogino, and J. Y. Chion.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 42, No 1, p 71-75, 1976. 5 tab, 1 fig, 10 ref.

Descriptors: *Magnesium, *Nutrient requirements, *Nutrients, *Carp, *Deficient elements, *Fish diets, *Calcium, *Fish physiology, *Growth rates, Essential nutrients, Fish diseases, Metabolism, Metals, Laboratory tests, Mortality, Methodology.
Identifiers: *Mineral needs.

Magnesium deficiency in carp was found to produce a loss of appetite, poor growth, high mortality, sluggishness and convulsions. The minimal requirement of young carp for magnesium was 0.04 to 0.05 per cent of a dry diet of 12 to 15 mg per kg body weight per day under the experimental

conditions. The magnesium content of vertebrate from carp fed diets containing low magnesium decreased significantly while the calcium content increased slightly. Thus, the values for Ca/Hg of the vertebrae were changed by the dietary magnesium level. (Katz)
W77-01239

ON THE ACUTE TOXICITY OF HERBICIDES FOR SELECTED AQUATIC ORGANISMS. II. TRIAZIN HERBICIDES AND AMITROL (ZUR AKUTEN TOXIZITAT VON HERBIZIDEN GEGENUBER AUSGEWAHLTEN WASSERORGANISMEN. TEIL 2: TRIANZINHERBIZIDE UND AMITROL),
Institut fuer Wasserwirtschaft, Berlin (East Germany).
M. Tscheu-Schluter.
Acta Hydrochimica et hydrooiologica, Vol 14, No 2, p 153-170, 1976. 4 fig, 7 tab, 17 ref.

Descriptors: *Algae, *Bioassay, *Toxicity, *Pesticide residues, *Triazine pesticides, *Organic pesticides, *Aminotriazole, *Herbicides, Environmental effects, Water quality control, Laboratory tests, Water pollution effects.
Identifiers: Poecilia sp, Ankistrodesmus sp, Simazin, Atrazin, Propazin, Desmetryn, Ametryn, Prometryn, Amitrol, Azaplant, Guppies.

The toxic effects of Simazin, Atrazin, Propazin, Desmetryn, Ametryn, Prometryn, Amitrol and Azaplant on Ankistrodesmus falcatus and Poecilia reticulata were examined. At threshold concentrations of less than 1 mg/l the Triazines are highly toxic to Ankistrodesmus, and at threshold concentrations of less than 10 mg/l they are highly toxic for Poecilia. For the six Triazines, relationships exist between the toxicity to algae and the chemical structure. With a wetting agent added, Azaplant is more toxic to fish than the pure agent. The highest allowable herbicide concentrations are given. (Katz)
W77-01240

THE EFFECT OF TEMPERATURE ON THE BEHAVIOR OF YOUNG TAUTOG, TAUTOGA ONITIS (L.),
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.
B. L. Olla, and A. L. Studholme.
In: Proceedings 9th European Marine Biology Symposium, H. Barnes, ed., Aberdeen University Press, 1975, p. 75-93, 4 tab., 5 fig., 16 ref.

Descriptors: *Temperature, *Fish behavior, *Environmental effects, *Benthic fauna,*Heated water, *Feeding rates, *Social behavior(Animal), *Juvenile fish, Laboratory test, Bottom fish, Food habits, Habitats, *Thermal pollution, *Thermal stress.
Identifiers: *Tautoga onitis, Tautog.

A series of experiments were conducted to investigate the effect of temperature on the activity, feeding, and shelter dependency of young tautog, Tautoga onitis, an inshore resident of the Atlantic coast from Nova Scotia to South Carolina. For each experiment, two fish were held under controlled laboratory conditions in one of two experimental systems while observations of activity, time spent in the tile shelter, aggressive encounters, and amounts ingested during feeding were recorded. As temperature was increased the various patterns were modified with activity, aggression, and feeding reduced and association with shelter increased. Five of the experimental fish, including two which had lost equilibrium, resumed normal activity and feeding when temperature was lowered to acclimation levels. (Katz)
W77-01241

METABOLIC ADAPTATIONS ON THE AEROBIC-ANAEROBIC TRANSITION IN THE SEA MUSSEL, MYTILUS EDULIS L.,
Utrecht Rijksuniversiteit (Netherlands). Lab. of Chemical Animal Physiology.
A. DeZwaan, A. M. T. deBont, and J. H. F. M. Kluytmans.
In: Proceedings 9th European Marine Biology Symposium, Harold Barnes, ed. Aberdeen University Press, 1975. p 121-138. 3 fig., 5 tab., 16 ref.

Descriptors: *Metabolism, *Amino acids, *Anaerobic conditions, *Aerobic conditions, Biochemistry, Tracers, Animal physiology, *Respiration, *Shellfish, Environmental effects, Methodology, Analytical techniques, Laboratory tests, Crustaceans, Invertebrates, Carbon radioisotopes, *Oxidation-reduction potential, *Mussels.
Identifiers: *Mytilus edulis, *Metabolic pathways.

The distribution of radioactivity over different classes of chemical compounds from marked glucose and glutamate in the sea mussel Mytilus edulis was examined after 2.5 n of aerobiosis and anaerobiosis. The anaerobic condition was started 15 h preceding the injection of the precursor. The switch to aerobic conditions caused inhibition in the conversion of glutamate, but the conversion of glucose was unaffected. For both precursors under anaerobic conditions the organic acids and amino acids together accounted for about 90% of the radioactivity, and under aerobic conditions for about 55%. Only alanine, aspartate and glutamate were involved. The influence of 17.5 h anaerobiosis on the concentration of glycogen, glucose, succinate, aspartate, glutamate, and alanine were studied. Only succinate showed a marked change, rising by a factor of 10. The results indicate that glutamate is used under both conditions but that the main source of succinate during anaerobiosis is carbohydrate. Glutamate only plays a minor role in the maintenance of the redox balance. (Katz)
W77-01242

MODIFIED BIOASSAY PROCEDURE FOR TOXIC EFFLUENTS,
Jyvaskyla Univ. (Finland). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-01243

LCH FLUCTUATIONS IN MYTILUS EDULIS L. IN RELATION TO SHELL MOVEMENTS UNDER AEROBIC AND ANAEROBIC CONDITIONS,
Utrecht Rijksuniversiteit (Netherlands). Lab. of Chemical Animal Physiology.
T. C. M. Wijsman.
Proceedings, 9th European Marine Biology Symposium, Harold Barnes, ed., Aberdeen University Press, 1975. p. 139-150, 8 fig., 1 tab., 21 ref

Descriptors: *Mussels, *Hydrogen ion concentration, *Acidity, *Environmental effects, *Bioassay, *Animal behavior, *Behavior, *Movement, *Animal physiology, *Aerobic conditions, *Anaerobic conditions, *Shellfish, *Metabolism, Water properties, Laboratory tests, Methodology, Crustaceans, Invertebrates, Enzymes, Biochemistry.

Continuous recordings of shell movements and pH in the extrapallial fluid of Mytilus edulis have been made under aerobic and anaerobic conditions. Short-term measurements of the pH in the foot were made after various periods of exposure to air. In both cases the pH decreases more than 0.3 units within 5 h of shell closure and after 1 day pH values of about 6.6 were obtained, caused by pH reductions of 0.5 to 0.9 units. If the mussel opens its shell on return to sea water, the pH reaches normal values of 7.3 to 7.5 within 2 hrs. A physiological significance of the pH reduction during anaerobiosis is found in the pH-dependence of the enzyme activities of pyruvate kinase and phosphoenolpyruvate carboxykinase. (Katz)
W77-01244

EFFECTS OF THE COOLING WAT DISCHARGE ON THE MACROINVE TEBRATES AND FISH POPULATIO AROUND FLEVO POWER STATION,
R. H. Hadderingh.
Verhandlungen International Vereinigung f theoretische und ungewandte Limnologie. Vol. p. 2214-2218, November 1975. 5 fig., 3 ref.

Descriptors: *Heated water, *Temperature, Po lation, Environmental effects, *Thermal wa *Cooling water, Powerplants, *Invertebra *Benthic fauna, Effluents, *Reproducti *Growth rates, *Pikes, Water pollution sourc Water pollution effects, Distribution patterns, site investigations, Diptera, Oligochaetes, Sna Worms, Crustaceans, *Thermal pollution.
Identifiers: Bream.

Investigations have been made for several ye on the influence of warm cooling water on fish macroinvertebrates around the Flevo power tion. Changes in the macroinvertebrates limited to small area around the outlet where t peratures are relatively high. These changes cluded increased growth rate, earlier hatchin eggs and population variations. With a few exc tions all of the more commonly occurring spec were found near both the intake and the out Fish were markedly more abundant near the ou than elsewhere in the lake. Negative effects fish condition were found in pike-perch bream. The spawning time of roach was advan by about two weeks near the outlet. (Katz)
W77-01245

SPATIAL DISPERSION OF AN ESTUARI BENTHIC FAUNAL COMMUNITY,
Swedish Water and Air Pollution Research La Goteborg.
For primary bibliographic entry see Field 5B.
W77-01246

AROMATIC HYDROCARBONS IN AQUA FAUNA,
Atlantic Biological Station, St. Andrews (N Brunswick).
For primary bibliographic entry see Field 5A.
W77-01247

THE EFFECTS OF MIREX AND METH YCHLOR ON THE GROWTH AND PROD TIVITY OF CHLORELLA PYRENOIDOSA,
Wheaton Coll., Norton, Mass. Dept. of Biology
J. C. Kricher, J. C. Urey, and M. L. Hawes.
Bulletin of Environmental Contamination Toxicology, Vol. 14, No. 5, p. 617-620, 197 tab., 8 ref.

Descriptors: *Chlorinated hydrocarbon pestic *Pesticides, *Insecticides, *Primary productiv *Bioassay, Chlorella, *Algae, *Aquatic pop tions, *Growth rates, Photosynthesis, Laborat tests, Water pollution effects, Aquatic pla Aquatic algae, Plant growth.
Identifiers: *Mirex, *Methoxychlor, *Chlor pyrenoiodosa.

The effects of mirex and methoxychlor, chlorinated hydrocarbon pesticides, on the po lation growth of Chlorella were examined. Pop tions treated with 100 ppb mirex were depres by 8 ompared to controls after 92 hr. The po lation density was 19% below that of the contro the end of the experiment after exposure to mi Populations treated with 100 ppb methoxych were 17% lower than controls when the exp ment was ended. The populations exposed to ppb mirex and 50 ppb methoxychlor in combi tion showed little deviation from the con group. This suggests that the two pesticides ef different physiological processes and that 50

each pesticide was below the toxicity threshold r Chlorella. (Katz)
77-01248

AILY PATTERN OF NITROGEN EXCRETION ND OXYGEN CONSUMPTION OF SOCKEYE ALMON (ONCORHYNCHUS NERKA) UNDER ONTROLLED CONDITIONS,
sheries and Marine Service, Nanaimo (British olumbia). Biological Station.
R. Brett, and C. A. Zala.
urnal of the Fisheries Research Board of nada, Vol. 32, p. 2479-2486, 1 tab., 3 fig., 19 ref.

escriptors: *Metabolism, *Ammonia, *Nitrogen mpounds, *Salmon, *Sockeye salmon, Diurnal, *Oxygen, *Ureas, Laboratory tests, orhythms, Aquiculture, Fish hatcheries, Fish anagement.

easurements of the rate of ammonia and urea cretion of fingerling sockeye salmon ncorhynchus nerka) (average weight -29 grams) ere made at 2-3-hourly intervals throughout the y. One group of fish was fed a maintenance ra- on while another group was starved for 22 days. mmonia excretion rose to a sharp peak of 35 mg /kg per hour, 4-4.5 h after the start of feeding (at 30) and fell to a baseline level of 8.2 mg N/kg per ur between 0200 and 0800. Urea excretion mained relatively steady at a mean rate of 2.2 mg /kg per hour throughout the day, showing no urnal response to feeding. Starved fish showed a trogen excretion rate close to that for both the eady state of urea excretion and the baseline rate ammonia excretion of the fed fish. Oxygen con- mption rose to 370 mg 02/kg per hour just before d during a 1-h feeding period, decreasing to a w of 170 mg 02/kg per hour at 0300 h. For the arved fish this diurnal metabolic fluctuation con- nued from the start in a variable and diminishing rm whereas nitrogen excretion showed no such sponse. It is concluded that for nonstressed sal- on at 15C ammonia is the chief excretory roduct of exogenous nitrogen metabolism. (Katz)
77-01250

YNERGISM OF INHIBITING ACTIONS OF EAVY METALS UPON THE FERTILIZATION ND DEVELOPMENT OF SEA URCHIN EGGS, N JAPANESE),
oshisha Univ., Kyoto (Japan). Biological Lab.
. Kobayashi, and K. Fujinaga.
he Science and Engineering Review of Doshisha niversity, Vol. 17, No. 1, p. 54-69, April, 1976. 7 b., 2 fig., 13 ref.

escriptors: *Reproduction, *Heavy metals, Copper, *Zinc, *Nickel, *Cadmium, Fertilization, Water pollution effects, *Growth tes, *Growth stages, Animal pathology, Eggs.
dentifiers: *Synergistic effects, *Anthocidaris ., *Hemicentrotus, Sea urchin eggs.

he effects of copper, zinc, nickel and cadmium n fertilization, cell division, and gastrulation of ea urchin eggs were studied, both as individual etals and paired. Hemicentrotus pulcherrimus nd Anthocidaris crassispina were exposed to con- entrations of metals at 2, 4, and 8 times the max- num level of non-inhibition. Hemicentrotus was ore sensitive to the effect of heavy metals than as Anthocidaris. Decreased fertilization rates, ell division, and gastrulation resulted from heavy etals exposure as did the appearance of olyspermy, permanent blastula and exogastrula, nd delay of development. Strong synergistic ef- ects occurred with Cu plus Zn, and less strongly ith Cu plus Cd and Zn plus Cd. Cu plus Ni, Zn lus Ni, and Ni plus Cd resulted in an additive in- ibition. (Katz)
77-01251

APPLICATION OF 24-HOUR POSTEXPOSURE OBSERVATION TO ACUTE TOXICITY STUDIES WITH INVERTEBRATES,
Viterbo Coll., LaCrosse, Wis. Dept. of Biology.
C. R. Hansen, Jr., and J. A. Kawatski.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 1198-1201, 1976, 1 tab., 10 ref.

Descriptors: *Laboratory tests, Methodology, *Toxicity, *Bioassay, *Dieldrin, *Invertebrates, *Midges, *Analytical techniques, *Mortality, *Testing procedures, Stress, Lethal limit, *Pollutant identification.
Identifiers: *Malathion, *Endothal, *Carbaryl, *TFM, Chironomus tentans, Cypretta kawatai.

Experimentation with carbaryl, dieldrin, endothal, malathion, and TFM (3-trifluoro-methyl-4-nitrophenol) on the ostracod Cypretta kawatai and the midge Chironomus tentans demonstrated that the method of routine toxicity tests with invertebrates can be substantially improved by including a posttreatment (toxicant free water) observation period. This improvement enables confirmation of death and thereby reveals latent toxicity or recovery. (Katz)
W77-01252

INFECTIOUS PANCREATIC NECROSIS: TRANSMISSION WITH IODINE-TREATED AND NONTREATED EGGS OF BROOK TROUT (SALVELINUS FONTINALIS),
Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va. Eastern Fish Disease Lab.
G. L. Bullock, R. R. Rucker, D. Amend, K. Wolf, and H. M. Stuckey.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 1197-1198, 1976. 5 ref.

Descriptors: *Fish diseases, *Fish eggs, *Brook trout, Diseases, *Infection, *Pest control, *Viruses, *Epidemiology, Trout, Salmonids, Biocontrol, Laboratory tests, Iodine, Disinfection.
Identifiers: *Salvelinus fontinalis, *Infectious pancreatic necrosis.

Experiments conducted simultaneously at two laboratories have shown brook trout (Salvelinus fontinalis) egg transmission of the virus of infectious pancreatic necrosis with eggs treated with 100 ppm iodine (as Wescodyne(R) and with nontreated eggs. (Katz)
W77-01253

COMPARATIVE MORTALITY STUDIES ON BIOMPHALARIA GLABRATA (MOLLUSCA: PULMONATA) EXPOSED TO COPPER INTERNALLY AND EXTERNALLY,
Lehigh Univ., Bethlehem, Pa. Inst. for Pathobiology.
J. T. Sullivan, and T. C. Cheng.
Journal of Invertebrate Pathology, Vol. 28, p. 255-257, 1976. 1 fig., 3 ref.

Descriptors: *Copper, Animal physiology, *Animal pathology, *Snails, *Toxicity, *Mortality, *Mode of action, *Path of pollutants, Metals, Gastropods, Invertebrates, Methodology, Mollusks.
Identifiers: *Biomphalaria glabrata, Copper sulfate.

Various concentrations of copper in the form of CuS04 were injected into the hemocoel of Biomphalaria glabrata, and mortality of this snail was subsequently monitored. The concentrations of copper in the hemolymph of injected snails were calculated, and specimens were incubated in these concentrations. Greater mortality was observed when snails were incubated in concentrations of copper than when they were injected with a sufficient amount of copper to attain these same concentrations in the hemolymph. Injection of copper into the hemocoel of B. glabrata resulted in the formation of a noncellular hemolymph precipitate, most likely denatured proteins, at the injection site, which was most noticeable with higher concentrations of copper. It has been concluded that external concentrations of copper are more cidal to B. glabrata than are internal, i.e., injected, concentrations. These data support the hypothesis that the cidal action of copper on B. glabrata is due to an attack on the mollusc's surface epithelia. (Katz)
W77-01254

PCB CONTENTS IN MARINE ANIMALS COLLECTED IN THE EAST CHINA SEA, (IN JAPANESE),
Hokkaido Univ., Sapporo (Japan). Lab. of Food Hygiene.
M. Takagi, A. Iida, and S. Oka.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 42, No. 7, p. 753-759, 1976. 3 tab., 4 fig., 19 ref.

Descriptors: *Polychlorinated biphenyls, *Absorption, *Path of pollutants, *Marine animals, *Pesticide residues, Chlorinated hydrocarbon pesticides, Water Pollution Sources, Analytical techniques, Pacific Ocean.
Identifiers: *East China Sea, Tissue analysis, *Kanechlor-600.

Twenty one species of marine animals were collected from the East China Sea. Muscle and liver tissues were analyzed for polychlorinated biphenyl (PCB) concentrations. PCB concentrations in muscle ranged from 0.01-0.06 ppm and from 0.08-0.28 ppm in liver. Bloody muscle contained higher PCB concentrations than did ordinary muscle. Kanechlor-600 (KC-600) was absent from muscle, but distinctly present in liver of all marine animals tested except Fugu chinensis. The median and standard deviation of the PCB concentration in muscle tissue showed 0.018 ppm and 0.250 ppm, respectively. Consequently, the degree of pollution with PCB of marine animals in the East China Sea was found to be very low as compared with that of fish from other areas. (Katz)
W77-01255

ACUTE TOXICITIES OF CRUDE OILS AND OIL-DISPERSANT MIXTURES TO RED SEA FISHES AND INVERTEBRATES,
Hebrew Univ., Jerusalem (Israel). Heinz Steinitz Marine Biology Lab.
R. Eisler.
Israel Journal of Zoology, Vol. 24, p. 16-27, 1975. 7 tab., 10 ref.

Descriptors: *Oil, *Oil wastes, *Toxicity, *Bioassay, *Mollusks, *Lethal limit, Water pollution sources, *Crustaceans, *Marine fish, Marine animals, Stress, *Pollution abatement, Water pollution effects, Invertebrates, Coral, Laboratory tests, Benthic fauna, Oil spills, Gastropods, Mussels, Animal behavior.
Identifiers: *Oil dispersants, *Crude oil, Heteroxenia fuscescens, Nerita forskali, Drupa granulata, Mytilus variabilis, Palaemon pacificus, Siganus rivulatus, *Persian Gulf, Gulf of Elat, *Red Sea.

Crude oil from fields in the Persian Gulf and in the Sinai plus a chemical oil dispersant were tested, using static bioassay procedures, for toxicity to adults or juveniles of ten marine species: Heteroxenia fuscescens, a soft coral; Nerita forskali and Drupa granulata, gastropod molluscs; Mytilus variabilis, a mussel; Acanthopleura haddoni, a chiton (mollusc); Echinometra mathaei, sea urchin; Calcinus latens, a hermit crab; Palaemon pacificus, a shrimp; Parupeneus barberinus, goatfish; and Siganus rivulatus, rabbitfish. Concentrations fatal to 50% of individual test species in 168 hours, LC-50 (168 h), ranged from 0.74 to more than 30.0 ml/liter for Persian Gulf crude, from 14.5 to more than 30.0 ml/liter for Sinai crude, and from 0.006 to 0.064 ml/liter for the dispersant. In general, fishes and crustaceans were the most sensitive groups assayed and molluscs the most resistant. LC-50 (168 h) values for oil-dispersant

mixtures of 10 parts oil t 1 part dispersant (v/v) for selected species ranged from 0.047 to 0.152 ml/liter which appears to reflect the biocidal properties of the dispersant. Some individuals that survived immersion in high concentrations of the test compounds for 168 h were adversely affected during treatment and afterwaRDS. (Katz)
W77-01256

THE ENVIRONMENTAL CHEMISTRY OF COPPER (II) IN AQUATIC SYSTEMS,
Australian Atomic Energy Commission Research Establishment, Lucas Heights, Div. of Chemical Technology.
For primary bibliographic entry see Field 5B.
W77-01257

THE EFFECT OF ARSENIC ON EMBRIONAL DEVELOPMENT OF RAINBOW TROUT (SALMO GAIRDNERI, RICH),
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland).
K. R. Dabrowski.
Water Research, Vol. 10, p. 793-796, 1976. 2 tab., 3 fig., 17 ref.

Descriptors: *Bioassay, *Rainbow trout, *Absorption, *Fish eggs, *Fish reproduction, *Arsenic compounds, *Toxicity, *Toxins, *Water pollution effects, *Embryonic growth stage, Salmonids, Reproduction, Laboratory tests, Growth stages, Hatching.
Identifiers: *Bioaccumulation, *Arsenic.

Studies were made on the toxic effect and accumulation of arsenic in developing eggs of rainbow trout. Fertile eggs were incubated at 6-7 C in sodium arsenate or arsenic trioxide solution at concentrations of 0.05-50.0 ppm As. The effect of arsenic on the survival of embryos and on the accumulation of the element in eggs were found to be related to the arsenic concentration and to the value of the arsenic ion in the arsenic compound used. (Katz)
W77-01258

MATHEMATICAL ANALYSIS OF THE CHEMICAL SYSTEM 'CYANIDE-HEAVY METALS' IN THE WATER-DETERMINATION OF COMPONENTS AND TOXICITY OF THE SYSTEM-I, THE THEORETICAL SOLUTION,
State Research Inst. of the Textile Industry, Brno (Czechoslovakia) Center for Research and Appplication Ionized Radiation.
For primary bibliographic entry see Field 5B.
W77-01259

MATHEMATICAL ANALYSIS OF THE CHEMICAL SYSTEM 'CYANIDE-HEAVY METALS' IN WATER-DETERMINATION OF COMPONENTS AND TOXICITY OF THE SYSTEM-II, SOLUTION BY COMPUTER,
State Textile Research Inst., Brno (Czechoslovakia). Center for Research and Application Ionized Radiation.
For primary bibliographic entry see Field 5B.
W77-01260

HEAVY METAL AND CHLORINATED HYDROCARBON RESIDUES IN CALIFORNIA SEA LIONS (ZALOPHUS CALIFORNIANUS CALIFORNIAUS),
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
D. R. Buhler, R. R. Claeys, and B. R. Mate.
Journal of the Fisheries Research Board of Canada, Vol. 32, p. 2391-2397, 1975. 4 tab., 28 ref.

Descriptors: *Heavy metals, Path of pollutants, *Absorption, *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Mammals, *Animal pathology, Animal physiology, DDE, Cadmium, Mercury, Environmental effects, Animal diseases, Polychlorinated biphenyl, DDD, DDT, Metabolishm, *Pollutant indentification.
Identifiers: Zalophus californianus calfornianus, *California Sea Lion, Tissue analysis, *Methylmercury, Bioaccumulation.

Samples of various tissues and organs from healthy California sea lions and sick animals (apparently with leptospirosis) collected along the central Oregon coast from 1970 to 1973 were analyzed for total mercury, methylmercury, cadmium, and chlorinated hydrocarbons. Maximum mercury concentrations of 74-170 ppm occurred in sea lion liver, with only 1.6-3.7 percent as methylmercury. Cadmium was concentrated primarily in the kidney which contained 7.2-12.0 ppm of the metal. Chlorinated hydrocarbon residues in sea lion fat ranged between 253-475 ppm DDE, and 21.4 and 34.1 ppm PCB. Although mercury, cadmium, and chlorinated hydrocarbon residues in some of the sick sea lions were significant higher than those present in healthy animals, it is possible to relate these differences to the onset of leptospirosis. (Katz)
W77-01261

LATENT EFFECTS OF IRANIAN CRUDE OIL AND A CHEMICAL OIL DISPERSANT ON RED SEA MOLLUSCS,
Hebrew Univ., Jerusalem (Israel). Heinz Steinitz Marine Biology Lab.
R. Eisler.
Israel Journal of Zoology, Vol. 22, p. 97-105, 1973. 2 tab., 4 fig., 8 ref.

Descriptors: Animal physiology, *Pollution abatement, Oil, Water pollution effects, Environmental effects, *Reproduction, *Predation, *Gastropods, *Feeding rate, *Oil pollution, Stress, Mussels, *Mollusks, Invertebrates, Productivity, Dispersion, Oil spills, Laboratory tests, Food habits, Inhibitors, Physiological ecology.
Identifiers: *Sublethal effects, *Mytilus variabilis, *Oil dispersants, Drupa granulata, *Red Sea mollusks.

Predation rate of the gastropod drill, Drupa granulata, on the mussel, Mytilus variabilis, was measured over a period of 28 days after adults from both species had been immersed for 168 h in seawater solutions containing high sublethal concentrations (10 ml/liter) of Iranian crude oil. Predation rate was three times higher in controls than in the group where both predator and prey had been exposed initially; intermediate values were determined among groups where only one species had been trated initially. Fecundity of drills, as evidenced by number of egg cases deposited, was directly related to mussel consumption. In a similar study with a chemical oil dispersant, exposure to high (0.003 ml/liter) sublethal levels for 168 h did not affect markedly the rate at which mussels were destroyed an consumed during post-treatmet. However, the fecundity of untreated drills feeding on untreated mussels (controls) was 3 to 10 times greater than among groups in which one or both species had been exposed initially to dispersant. Except for mussels consumed by drills, there were no deaths during the post-treatment period in either study, and all organisms appeared normal. (Katz)
W77-01262

THE ACCUMULATION OF PCB AS A FUNCTION OF GROWTH IN JAPANESE ANCHOVY CAUGHT IN OSAKA BAY, (IN JAPANESE),
Osaka Prefectural Fisheries Experimental Station, (Japan).
H. Joh, S. Yamochi, and T. Abe.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 42, No. 1, p. 123-130, 1976. 3 tab., 8 fig., 10 ref.

Descriptors: *Polychlorinated biphenyls, *Pesticide residues, *Absorption, *Animal growth, *Lipids, Length, *Path of pollutants, Analytical techniques, Fish migration, Mari fish, Marine pollution.
Identifiers: Engraulis japonica, *Japane anchovy, *Bioaccumulation, *Osaka Bay(Japan

Concentration of PCB in Japanese anchovy, E graulis japonica, from Osaka Bay increases ponentially with body length and proportiona with body weight. In two sample groups with co paratively distinguishable features, the PCB c centration plotted versus body weight gave val which were distributed on two straight lines of fering slopes. It is suggested that one group w hatched in Osaka Bay, and the other in open and migrated to Osaka Bay. The difference in PCB accumulation rate of the two groups probably due to the different intake of lipids d ing the limited period of anchovy growth, as dicated by the nearly linear functional relationsh between the total oil and the total PCB content whole anchovy. (Katz)
W77-01265

CHRONIC EFFECTS OF REDUCED PH BROOK TROUT (SALVELINUS FONTINALIS
West Virginia Dept. of Natural Resources Elki Div. of Wildlife Resources.
R. Menendez.
Journal of the Fisheries Research Board Canada, Vol. 33, p. 118-123, 1976. 3 tab., 1 fig., ref.

Descriptors: *Hydrogen ion concentrati Laboratory tests, *Bioassay, *Trout, *Grow rates, Hatching, *Acidic water, *Fish eg *Acidity, Environmental effects, *Growth stag *Fry, Fish reproduction, Water pollution effe Acid mine wastes, Water quality control, F physiology, *Embryonic growth stage.

During an eleven month period all developmen stages of the brook trout (Salvelinus fontina were continuously exposed to pH levels of 5.0, 5.5, 6.0, 6.5, and the control of 7.1. number of viable eggs decreased significantly pH 5.0 and to a lesser extent at the higher levels. Embryo hatchability was significantly at all pH levels below 6.5. Growth and survival alevins was reduced at the lower pH levels. Th data indicate that continual exposure to pH val below 6.5 will result in significant reductions in hatchability and growth. (Katz)
W77-01266

MERCURY IN EGGS OF NORWEGI SEABIRDS,
Tromsoe Univ. (Norway). Inst. Biology Geology.
For primary bibliographic entry see Field 5A.
W77-01267

SOME EFFECTS OF KUWAIT CRUDE OIL THE LIMPET, PATELLA VULGATA,
Field Studies Council, Penbroke (England). Pollution Research Unit.
B. Dicks.
Environ Pollut. 5(3), p 219-229, 1973.

Descriptors: *Oil pollution, *Toxicity, Mollus *Gastropods, *Testing, Water pollution effe Oil spills.
Identifiers: *Crude oil, Kuwait, *Limpet, Pate vulgata.

A simple toxicity test for pollutants associa with the oil industry using the limpet, P. vulgat described. This test with an organism of consid ble importance to the ecological balance of rocky shore takes into account some of the crit likely to be of importance to mortality in nat populations after an oil spillage. As such, it all some prediction of the ecological effects of a spill on the shore. Natural rhythm in activit shown to affect the susceptibility of the lim population to crude oil, greatest toxic effects

ing during times of greatest activity. A circadi-hythm is demonstrated in the activity of the et. There appears to be no difference in the city of crude oil to large and small specimens.--yright 1974, Biological Abstracts, Inc.
-01275

VER GREEN BAY. AN EVALUATION OF STING AND HISTORICAL CONDITIONS,
consin Dept. of Natural Resources, Madison.
pstein, M. Bryans, D. Mezei, and D.
erson.
ort No. EPA-905/9-74-006, June 1974. 293 p. 30 24 tab., 71 ref., 11 append.

criptors: *Bays, *Lake Michigan, *Water pol-n effects, *Data collections, *Wisconsin, Ox-n sag, Eutrophication, Water pollution control, er pollution sources, Biochemical oxygen de-d, Benthic fauna, Bottom sediments, Silting, utaries, Water circulation, Attitudes, Compet-uses, Pulp wastes, Pulp and paper industry, te treatment, Sewage effluents, Alkalinity, rients.
ntifiers: *Green Bay(Lake Michigan), Fox er(Wis), Oconto River(Wis), Peshtigo er(Wis), Menominee River(Wis).

Fox River remains the major pollution source Green Bay. The BOD-5 and suspended solids harges from paper mills along the river are approximately what they were 20 years ago r an intermidiate period of higher lings;BOD-5 loadings from sewage plants have n in the past ten years along the Lower Fox er depositing a high content of sludge at the ex-ne end of the bay. Below Sturgeon Bay there several areas where the depth has substantially reased during the past 17 years, an indication the bay is filling at a higher rate than larger ies of water. A change in commercial fish spe-has occurred since 1900 representing a shift n high quality native species to low quality ex-s. If pollution of the bay continues the bottom na will become the type associated with gross lution, a larger abiotic area around the river ith can be expected, midge larvae abundance ld decrease further north, and Oligochaetes ld become even more dominant. Data for pulp te loadings to the Lower Fox River, sewage ef-nts, estimated phosphorus loadings through utaries to the bay, nitrogen concentrations, pended solids, chlorides, light transparency, ductivity, fish species, bottom fauna and dis-ved oxygen concentrations are compared ween 1938 to 1970. (Auen-Wisconsin)
7-01287

E NUTRITION OF GREAT LAKES ADOPHORA,
sconsin Univ., Madison. Water Resources ter.
C. Gerloff, and G. P. Fitzgerald.
port EPA-600/3-76-044, April 1976. 120 p. 9 fig., ab., 38 ref.

scriptors: *Nutrient requirements, adophora, *Vitamin B, *Boron, *Sulfur, reat Lakes, Cultures, Algae, Nitrogen, sphorus, Ammonia, Nitrates, Water pollution, c, Bioassay, Growth rates, Limiting factors.
ntifiers: Cladophora glomerata.

cedures for laboratory culturing of dophora, a nuisance green alga in the Great kes, were developed. Cladophora glomerata st have external vitamins B-1 and B-12 sup-s. With added vitamins, Cladophora can be cul-ed in completely defined media. When evalu-d as critical cell concentrations (minimum con-trations which permit optimum growth), dophora had relatively low nitrogen and sphorus requirements and very high boron and fur requirements. Cladophora can use am-nia- and nitrate-nitrogen and ortho-, pyro-, ta-, and tripoly-phosphorus for growth, but phosphite-phosphorus was relatively unavailable. Cladophora phosphorus concentrations from all the Great Lakes correlated with pollution of specific areas; phosphorus was limiting or close to limiting in areas with little pollution. Phosphorus reduction might be a practical way to reduce Cladophora growth. Nitrogen was not limiting, but boron and possibly zinc and vitamin B-1 may be. Plant bioassays are recommended to evaluate nutrient supplies and growth-limiting nutrients for Cladophora in Natural environments. Critical concentrations and the range of concentrations of nitrogen, phosphorus, calcium, magnesium, potassium, sulfur, iron, zinc, manganese, copper, molybdenum, and boron were determined. Cladophora appeared relatively insensitive to high temperature with optimum yields maintained at 30-31C. Its growth was reduced to 63% of optimum at 16-17.5C. (Buchanan-Davidson--Wisconsin).
W77-01288

WORKSHOP ON TOXICITY TO BIOTA OF METAL FORMS IN NATURAL WATER.
International Joint Commission-United States and Canada.
Held October 7-8, 1975 at Duluth Minnesota. R. W. Andrew, P. V. Hodson and D. E. Konasewich, editors. April 1976. 333 p.

Descriptors: *Heavy metals, *Toxicity, *Great Lakes, *Water quality standards, International Joint Commission, Conferences, Organic compounds, Mode of Action, Mathematical models, Chemical reactions, Pollutant identification, Air environment, Absorption, Biota, Persistence, Distribution, Food webs, Fish, Algae, Bottom sediments, Suspended solids, Chelation, Marine algae, Lethal limit, Solubility, Absorption, Analytical techniques, Speciation, Molecular structure.
Identifiers: Synergistic effects, Antagonistic effects, Additive effects, Toxic units, Metal detoxification, Bioaccumulation, Stability constants, Application factor.

This proceedings focused on the current knowledge concerning the toxicity and availability to aquatic biota of various forms and molecular complexes of metals to assist the International Joint Commission's Water Quality Board in developing water quality objectives for the Great Lakes. The chemistry of heavy metals was reviewed and the total, soluble, particulate, extractive, colloidal, chelated, complexed, bound, hydroxides, chlorides, carbonates and sulfates were considered in terms of total metal. Of prime interest was the relationship of metal forms to toxicity, and if that can be established, how it can be measured with sufficient sensitivity and accuracy. Presentations discussed the molecular structure-activity relations and their toxicity, and metal speciation and their toxicity. Other contributions discussed heavy metal standards on the basis of their dissolved forms, effects of organic pollutants on copper toxicity to fish, copper toxicity to phytoplankton as affected by organic ligands, other cations, and algal tolerance. Presentations also dealt with complexation of metals, potential roles of metal-ligands in seawater, distribution and bioaccumulation of mercury, pharmokinetic approaches to the evaluation of methylmercury to fishes, molecular forms of arsenic, and additive actions and interactions in the toxicity of mixtures of heavy metals and organic compounds. The final chapter is devoted to a comprehensive discussion and research needs. (See W77-01296 thru W77-01309) (Auen-Wisconsin)
W77-01295

COMPLEXATION OF METALS IN NATURAL WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
Y. K. Chau, and P. T. S. Wong.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p 187-196, April 1976. 3 fig, 1 tab, 9 ref.

Descriptors: *Heavy metals, *Toxicity, *Chelation, Organic matter, Copper, Algae, Canada, Lead, Zinc, Nickel, Scenedesmus.
Identifiers: Metal detoxification, Ligands, Ankistrodesmus falcatus, Sudbury(Ontario).

A significant fraction of the trace metals in waters is believed to exist in complexed forms with miscellaneous organic ligands, whose abundance and complexing characteristics regulate the availability of heavy metals to biota. The forms of metals, toxic effects, complexing capacity of water and its effect in ameliorating metal toxicity are discussed. Tests conducted with lake waters in the Sudbury, Ontario, district showed a correlation between complexing capacity with either dissolved organic carbon or dissolved organic nitrogen or both. The relationship between complexing capacity of a lake and algal growth was studied with Ankistrodesmus falcatus in waters containing high concentrations of zinc, nickel, copper and lead, and all exhibited varying degrees of toxicity. Further experiments on the relationship between complexation and toxicity reduction to algae with Scenedesmus quadricauda were conducted with 500 ppb lead, with various degrees of growth inhibition. The toxic effects of metals in an aquatic system depend greatly on several factors, with complexing capacity the most significant; other factors affecting toxicity are alkalinity, hardness, nutrient concentration and pH. Unless it is possible to vary the complexing capacity of water samples without changing the other parameters, the sole effect of complexing capacity cannot be quantitatively assessed. At present it is impossible to vary the amount of ligands without altering the other parameters. (See also W77-01295) (Auen-Wisconsin)
W77-01296

DISTRIBUTION AND BIOACCUMULATION OF MERCURY IN BIOTIC AND ABIOTIC COMPARTMENTS OF A CONTAMINATED RIVER-RESERVOIR SYSTEM,
Oak Ridge National Lab., Tenn.
S. G. Hildebrand, A. W. Andren, and J. W. Huckabee.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p 211-230, April 1976. 4 fig, 5 tab, 30 ref. NSF (RANN) AG-389.

Descriptors: *Mercury, *Biota, *Distribution, Benthos, Fish, Food webs, Absorption, Virginia, Tennessee, Bottom sediments, Suspended solids, Shiners, Suckers, Rock bass, Heavy metals.
Identifiers: *Bioaccumulation, *Methylmercury, North Fork Holston River(Va), Cherokee Reservoir(Va), Hogsuckers, Chlor-alkali plant.

Studies were conducted in the North Fork of the Holston River-Cherokee Reservoir, Virginia, which receives leached mercury from an abandoned chlor-alkali plant's waste disposal ponds, to determine the behavior and ultimate fate of mercury in that system. The dissolved mercury is rapidly adsorbed onto suspended particulates and the major downstream transport of mercury appears to take place in the particulate phase. Total mercury and methylmercurials in fish and benthic invertebrate taxa were highest immediately below the source then decreased downstream. The pattern was similar to the downstream distribution of mercury in water and sediments. Total mercury in rockbass 83 miles downstream from the source exceeded 1.0 ppm. Approximately 80% of mercury in rock bass, hogsucker, and shiners in the river was methylmercury and on the order of 50% of mercury in benthic invertebrates was methylmercury. No methylmercury had been detected in river bed sediments. Dietary uptake of methylmercury by fish feeding on benthic invertebrates may be a significant route of entry of methylmercury into food webs but the mechanism of accumulation of methylmercury in the three fish species is unresolved. (See also W77-01295) (Auen-Wisconsin)
W77-01297

ZINC SPECIATION AND TOXICITY TO FISHES,
Montana State Univ., Bozeman. Dept. of Chemistry.
G. K. Pagenkopf.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p 77-91, April 1976. 3 fig, 5 tab, 23 ref.

Descriptors: *Zinc, *Toxicity, *Fish, *Chemical properties, Model studies, Speciation, Reviews, Atlantic salmon, Bioassay, Minnows, Rainbow trout, Sunfishes.
Identifiers: Bluegills, Fathead minnows, Goldfish, Guppies, Zebrafish, Chemical constants.

A variety of bioassay experiments defining zinc speciation and a model of zinc solubility are discussed. One extreme of the model is that all of the zinc carbonate solid phase has formed, however, the particle size is small and precipitation has not occurred. The other extreme assumes that no solid phase is formed. The literature survey indicates that there is sufficient analytical data to permit calculations of zinc speciation. The data includes pH, alkalinity, hardness (Ca and Mg), sulfate concentration and LC50 of zinc. Data is available for fathead minnows, bluegills, rainbow trout, goldfish, guppies, zebrafish and Atlantic salmon. The studies indicate that the presence of calcium and magnesium reduces the effect of zinc. An increase in pH from 6 to 8 is accompanied by a sizable reduction in zinc LC50. Usually this change is pH is accompanied by an increase in the amount of solid zinc carbonate present. It is not recommended that these acute toxicity studies be utilized for establishing zinc toxicity limits, as the precise formation of the zinc solid phase is unknown. Fish may tolerate predicted soluble zinc levels, at least for short periods, in waters of average hardness, alkalinity and pH. The toxicity of elevated zinc levels depends on the rapidity of its precipitation. (See also W77-01295) (Auen-Wisconsin)
W77-01298

STRUCTURE-ACTIVITY RELATIONS AND THE TOXICITY OF TRACE ELEMENTS TO AQUATIC BIOTA,
Atlantic Biological Station, St. Andrews (New Brunswick).
V. Zitko.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p 9-32, April 1976. 2 fig, 3 tab, 60 ref.

Descriptors: *Trace elements, *Heavy metals, *Toxicity, *Molecular structure, International Joint Commission, Great Lakes, Cations, Hardness(Water), Mode of action, Environmental effects, Bonding, Cohesion, Adsorption, Chemical reactions.
Identifiers: Bioaccumulation, Detoxification.

The majority of inorganic compounds exist in the form of ions whose biological activity is a function of their binding to ionizable groups in organic compounds. Strongly bound ions block the ionizable groups and change or inhibit the normal biological functions of organic compounds. Development of binding constants to organic compounds may lead to good correlations; glycine is a good compound for correlations, and binding constants of many cations are available. The indications are that the toxicity (incipient lethal level) is a linear function of hardness and the slopes and intercepts calculated from published data are presented. The recognized toxicity reduction by organic matter may be due to the active sites in organic molecules which bind cations in the form of nontoxic complexes and an equation could be used to describe the effect of organic matter on toxicity. Competition between organic compounds and tissues to bind the toxic cations could also play a role in the toxicity-decreasing effect of organic matter. Water analyses are important for the determination of equilibrium constants which, once known, make it possible to calculate the concentrations of various ionic species and complexes and then could be expressed in 'toxic units.' (See also W77-01295) (Auen-Wisconsin)
W77-01299

METAL SPECIATION IN AQUATIC ENVIRONMENTS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
H. E. Allen, M. L. Crosser, and T. D. Brisbin.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p 33-57, April 1976. 7 fig, 21 ref.

Descriptors: *Metals, *Speciation, *Chemical properties, *Toxicity, *Analytical techniques, Ion exchange, Electrophoresis, Chemical reactions, Measurement, Electrochemistry, Equations, Chelation.
Identifiers: *Stability constants.

Measurement of the total metal concentration is insufficient to determine its biological effects as the chemical form of the metal must be known to permit accurate interpretations of both its degree of toxicity and geochemical reactions. Prediction of trace metal levels, their forms and transformations (complexations) requires the development of mechanistic models which are based on equilibrium constants of metal complexes. Recent applications of electroanalytical techniques, such as anodic stripping voltammetry, differential pulse polarography, and differential pulse anodic stripping voltammetry have been applied to the measurement of stability constants. Their applications and results are discussed. Proposed is the use of the ion exchange equilibrium technique for measurement of both stability constants and of complexation capacity; it is also useful in defining the significance of a stability constant in a multiligand system. Application of the ion exchange equilibrium to the study of a complexation in AAP medium used for toxicity studies, complexation of metals in sewage treatment plants, and assessment of the relative significance of ligands entering the aquatic environment from various sources is presented. (See also W77-01295) (Auen-Wisconsin)
W77-01300

PHARMACOKINETIC APPROACHES TO THE EVALUATION OF METHYLMERCURY IN FISH,
Michigan Univ., Ann Arbor. Public Health Toxicology Program.
R. Hartung.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p. 233-248. April 1976. 6 fig., 3 tab., 8 ref.

Descriptors: *Mercury, *Fish, *Absorption, *Distribution, *Mathematical models, Persistence, Metabolism, Eels, Piles, Lake trout, Heavy metals.
Identifiers: *Methylmercury, *Mercury bioaccumulation, Methylmercury excretion.

Some of the simpler pharmacokinetic models are applied to existing data for the evaluation of the uptake of methylmercury by fish and its relationship to methylmercury environmental levels. The model cited attempts to duplicate many of the naturally occurring processes by using many compartments and rate constants. The methodology indicates that it is possible to effectively present uptake, storage, and elimination data by relatively simple kinetic equations. The model of uptake and accumulation was tested with several existing data sets and invites additional testing to explore its limitations and possible refinements. Improved precision appears possible, especially if additional information on elimination rate constants could found for the species examined. The estima equilibrium concentration and the theoret bioaccumulation coefficient appear to have sign cant utility in comparing experimental results w one another. The data tested had been compi for pike, eel, and lake trout. Species differen with respect to uptake appear to be less signific than anticipated; however, temperature effe possibly due to metabolic rates, were found to pronounced and systematic. The kinetic analys particularly useful in permitting comparis among bioaccumulation studies and appears have potential for establishing an approach relating experimental data to environmental d (See also W77-01295) (Auen-Wisconsin)
W77-01301

MOLECULAR FORMS OF ARSENIC IN T ENVIRONMENT,
University of South Florida, Tampa. Dept Chemistry.
For primary bibliographic entry see Field 5A.
W77-01302

THE MULTIPLE TOXICITY OF CERT HEAVY METALS: ADDITIVE ACTIONS A INTERACTIONS,
Concordia Univ., Montreal (Quebec). Dept Biological Sciences.
P. D. Anderson, and L. J. Weber.
In: International Joint Commission's Worksh Proceedings 'Toxicity to Biota of Metal Form Natural Water', October 7-8, 1975, Duluth, M p. 263-282, April 1976. 7 fig., 5 tab., 17 ref.

Descriptors: *Heavy metals, *Toxicity, *Mix *Organic compounds, Chemical reactions, M of action, Measurement, Mathematical mo Copper, Zinc, Nickel, Chlorinated hydroca pesticides, Potassium compounds, Dieldrin.
Identifiers: *Synergistic effects, *Antagonisti fects, *Additive effects, Guppies, Toxic u Potassium pentachlorophenate, Potassium nide.

Results of studies conducted with chloride sal copper, nickel, zinc, and HEOD--a chlorin hydrocarbon pesticide (Dieldrin), potassium tachlorophenate (KRCP) and potassium cya (KCN) to determine their additive, synergist antagonistic effects on guppies are described. approach for studying multiple toxicity may vide an adequate method for (1) identificatio both similar-acting toxicants and synergistic cants and (2) the prediction of the mixture's to ty. The organic compounds acted independ not only in relation to each other in a binary ture but also in the presence of heavy metals quarternary mixture. Nevertheless, assump may be drawn that the lethal action of dieldri KPCP were not altered by the presence of concentrations of heavy metals or vice v However not all organic compounds act syner cally, antagonistically or by strict add Furthermore certain organic toxicants may a chelating agents which effectively remove toxic forms of heavy metals. The apparent de stration in these studies of independently a toxicants as constituents of a mixture suppo Toxic Unit principle, i.e., that safe l established for individual toxicats will also pr an adequate safeguard against mixtures. sublethal effects of these toxicants were n vestigated. (See also W77-01295) (Auen-Wi sin)
W77-01303

TOXICITY RELATIONSHIPS TO CO FORMS IN NATURAL WATERS,
Environmental Research Lab., Duluth, Minn.
R. W. Andrew.
In: International Joint Commission's Work Proceedings 'Toxicity to Biota of Metal For Natural Water', October 7-8, 1975, Duluth, p. 127-143. April 1976. 4 fig., 5 tab., 22 ref.

scriptors: *Copper, *Toxicity, *Chemical properties, Water chemistry, Minnows, Daphnia, drogen ion concentration, Heavy metals, Solubility, Chelation, Bioassay, Fish, Waterfleas, Conidation.
ntifiers: *Cupric ion, Fathead minnow.

ts with fathead minnows and Daphnia magna nonstrated that copper toxicity is largely a ction of the cupric ion activity and that toxicity iations primarily occur as a result of changes in ic activity either through precipitation or comxation. Copper precipitation as hydroxides, bonates, and/or phosphates results in toxicity uctions. In highly alkaline waters with a imum of soluble complexing or chelating nts, measurements of dissolved copper may e a fair approximation of the biologically active m with attendant reduction in the toxicity varie. LC50 values based on total copper measurents in such situations were totally irreproduci- and have little value even as an indicator of ative toxicity. None of the soluble (dissolved) nplexes or chelated forms, including organic l inorganic complexes and neutral and ionized ms, are appreciably toxic. Toxicity of the pric ion may be modified by interaction with er cations, particularly hydrogen ions. Calcium l magnesium do not appear to be a major factor copper toxicity. Both bicarbonate alkalinity and hophosphate have major roles in limiting pper toxicity; however cupric ion toxic levels n be accurately measured and/or monitored in w-through bioassays. Increasing toxicity of pric ion at high pH is hypothesized to result m interactions with sulfhydryl-containing otc...s or enzymes. (See also W77-01295) (Auensconsin)
77-01304

IE NEED TO ESTABLISH HEAVY METAL ANDARDS ON THE BASIS OF DISSOLVED ETALS,
lorado Div. of Wildlife, Fort Collins. Research nter.
r primary bibliographic entry see Field 5A.
77-01305

PECTS OF HEAVY METALS TOXICITY IN ESH WATERS,
ater Pollution Research Centre Stevenage ngland).
M. Brown.
International Joint Commission's Workshop oceedings 'Toxicity to Biota of Metal Forms in tural Water', October 7-8, 1975, Duluth, Minn. 59-75, April 1976. 2 tab., 35 ref.

scriptors: *Heavy metals, *Toxicity, peciation, Aquatic animals, Fish, Solubility, sorption, Trace elements, Stability, Suspended ids, Ions, Hydrogen ion concentration, Hardss(Water), Calcium carbonate, Cadmium, pper, Zinc, Consolidation, Chromium, Nickel.
ntifiers: *Toxicology, Synergistic effects, Angonistic effects.

e problems involved in the determination of the xicity of the chemical components of heavy tals, their synergistic/antagonistic effects with ier metal chemials, the pH, water hardness, and spended solids, are discussed. Tests of single bstances and single species (often only acute hal tests) to define 'acceptable' levels are inid determinations of toxic levels particularly der chronic exposure or fluctuating concentrans. When it comes to assessing the effects of riously mixed effluents, it is impossible to fully scribe their chemical components let alone their fects; and even if these effects were identifiable, ir biological effects would still be unpredicta-. Included in this presentation are the types of avy metal contaminations, basic aspects of their xicology to animals (particularly fishes), and me of the work on the toxic aspects of the emical states of copper, cadmium, zinc, chromium, nickel, and their interactions with suspended solids and chelating compounds. One conclusion is that because in hard waters chemical availability of the cupric ion tends to limit toxic concentrations whereas in soft waters it is the physiological aspects of fishes and of the non-specificity of both heavy metals and ligands, it is unlikely that precise definitions of toxic relations are possible. (See also W77-01295) (Auen-Wisconsin).
W77-01306

COPPER TOXICITY TO PHYTOPLANKTON, AS AFFECTED BY ORGANIC LIGANDS, OTHER CATIONS AND INHERENT TOLERANCE OF ALGAE TO COPPER,
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
P. Stokes, and T. C. Hutchinson.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p. 159-185, April 1976. 14 fig., 3 tab., 26 ref.

Descriptors: *Copper, *Toxicity, *Plant physiology, *Resistance, *Algae, Organic matter, Cations, Heavy metals, Ions, *Canada, Nickel, Chlorella, Scenedesmus, Chelation, Absorption.
Identifiers: Sudbury(Ontario), Metals tolerance.

In addition to the speciation of metal and metal movement through aquatic ecosystems, toxicity is dependent on the physiological processes of the organisms themselves. The effect of the chemistry of a particular metal on an organism is mediated by the effect of pH and cations. The organisms complete with non-living parts of the system as binding sites consequently the actual thresholds of toxicity even for closely related biota vary widely. Field and laboratory studies attempted to relate the toxicity of the form and concentration of heavy metals to algae (Scenedesmus and Chlorella), particularly of 'labile' and 'bound' metals to the relationship between chemical measurements and metal toxicity. The field sites centered around the Sudbury, Ontario, mining and smelting region where some lakes have been recorded to contain 6.4 ppm levels of nickel and 1.0 ppm of copper. Five lakes were selected with varying organic and heavy metal contents, and with a pH higher than 6.0. It was found that copper tolerance has evolved in some of the algae. The major difference in algal response could be accounted for by differences in organic matter and by their relative complexing capacity. The test information generated has little direct application but does have potential for a number of chemical and biological assays for water quality determinations. (See also W77-01295) (Auen-Wisconsin)
W77-01307

POTENTIAL ROLES OF METAL-LIGANDS IN THE MARINE ENVIRONMENT,
Environmental Research Lab., Narragansett, R. I.
For primary bibliographic entry see Field 5B.
W77-01308

EFFECTS OF ORGANIC POLLUTANTS ON COPPER TOXICITY TO FISH,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
D. P. Chynoweth, J. A. Black, and K. H. Mancy.
In: International Joint Commission's Workshop Proceedings 'Toxicity to Biota of Metal Forms in Natural Water', October 7-8, 1975, Duluth, Minn. p. 145-157, April 1976. 5 tab., 31 ref. FWPCA 14-12-591.

Guppies were exposed to copper at 50-500 microgram/l concentrations in the presence of various organic ligands in moderately hard water (66.8-98.0 mg/l calcium carbonate) maintained at pH 7.5. The organic compounds were selected on the basis of their prevalence as pollutants or their complexing properties. Glycine, cysteine, EDTA, NTA, and citric acid were added at concentrations of 0.0000036 M. Albumin, humic acid, and secondary sewage effluent were added to give a final concentration of 5 mg/l (as total organic matter). Median lethal copper doses were calculated using log probit analyses of the bioassay data. The relative binding capacities of the organic ligands were determined by anodic stripping voltammetry. The toxicity results were compared to the stability of the copper-organic complexes in the bioassay solutions. Test fish were analyzed by atomic absorption spectrophotometry to determine the amount of copper accumulation in the internal organs. An inverse relationship was observed between the degree of copper binding and copper toxicity. No significant correlation was obtained between organic binding or toxicity and uptake of copper by fish. Unresolved are the effects of alkalinity and hardness on copper toxicity; toxicity of copper complexed with inorganic and organic particulates; toxicity of copper contained in fish food; and sites and mechanisms of copper toxicity. (See also W77-01295) (Auen-Wisconsin)
W77-01309

SYMPOSIUM ON STRUCTURE-ACTIVITY CORRELATIONS IN STUDIES OF TOXICITY AND BIOCONCENTRATION WITH AQUATIC ORGANISMS.
International Joint Commission-United States and Canada.
March 11-13, 1975, Canada Center for Inland Waters, Burlington, Ontario. 352 p. G. D. Veith and D. E. Konasewich, editors.

Descriptors: *Chemicals, *Molecular structure, *Toxicity, Sorption, Solubilitv, Organic compounds, Testing, Food chains, Osmosis, Surfactants, Linear alkylate sulfonates, Lethanl limit, Daphnia, Minnows, International Joint Commission, Phenols, Analytical techniques, Bioassay, Fish, Animal pathology, Mode of action, Rainbow trout, Pesticides, Persistence, Measurement, Penetration, Chemical reactions, Solutes, Pollutants, Mathematical models, Correlation analysis, Permits, Standards, Distribution, Pollutant identification.
Identifiers: Bioconcentration, Toxic units, Combined toxicants, Synergism, Antagonism, Multivariate analysis, Partition coefficients, Depuration, Biological half-life, Sub-lethal effects, Toxicology.

The contributions centered on the structure of chemicals as they relate to toxicity and biomagnification/bioaccumulation with the underlying thrust of further research requirements. Papers discussed the structure-activity relationships in toxicology of fish and Daphnia; surfactant, phenolic compounds, and DDT analogs and their toxicity, uptake, depuration; and intertissue movement of hydrophilic, amphiphilic, and hydrophobic compounds as related to fat solubility. Presentations discussed the use of the n-octanol/water partition coefficient in predicting the bioconcentration potential of organic chemicals, and its use in the evaluation of the relative hazards of various chemicals. Other papers related to the comparison of analytical methods in the relationship between chemical and biological properties of chemicals; utilization of available environmental data for toxicity studies; the study of multiple toxicity; and mathematical models for the time/space distribution of chemicals in water. Also, details are given for a permit system to control chemical pollution based on a toxicity index. A panel discussion followed the presentations, generating the conclusions that structure-activity correlations can be successfully applied to toxicity testing by using the n-octanol/water partition coefficient, the Hammet sigma constant, the field and resonance constants and the pK. The correlations can be applied to structurally related chemicals exhibiting the same mode of action and the same biological endpoint. The correlations are not likely to predict the toxicity of complex effluents. The chemical uptake rates significantly affect the death rate in acute toxicity tests. (See W77-01311 thru W77-01322) (Auen-Wisconsin)

W77-01310

SURFACTANT STRUCTURE AND AQUATIC TOXICITY,
Monsanto Chemical Co., St. Louis, Mo.
For primary bibliographic entry see Field 5A.
W77-01311

PREDICTING A BIOCONCENTRATION POTENTIAL OF ORGANIC CHEMICALS IN FISH FROM PARTITION COEFFICIENTS,
Dow Chemical Co., Midland, Mich.
D. R. Branson, W. B. Neely, and G. E. Blau.
In: International Joint Commission Symposium on 'Structure-Activity Correlations in Studies of Toxicity and Bioconcentration with Aquatic Organisms,' March 11-13, 1975, Canada Center for Inland Waters, Burlington, Ontario, p 99-118. 2 fig, 5 tab, 13 ref.

Descriptors: *Chemicals, *Absorption, *Measurement, Food chains, Rainbow trout, Organic compounds, Toxicity, Osmosis.
Identifiers: *Bioconcentration, Partition coefficient.

The ratio of the equilibrium concentration of a chemical between a nonpolar and polar solvent (in this instance n-octanol and water), i.e., the partition coefficient, was used to examine the relationship between the physiochemical properties of chemicals and their ability to bioconcentrate. The chemicals with a wide range of partition coefficients, included 1,1,2,2-tetrachloroethylene, hexachlorobenzene, 2,2',4,4'-tetrachlorobiphenyl, 2-biphenyl phenyl ether, diphenyl ether, carbon tetrachloride, and p-dichlorobenze. The relationship was established by measuring the bioconcentration (the ratio of the concentration of the chemical between trout muscle and the exposure water measured at equilibrium) in trout. The following equation of the straight line can best be used to predict the bioconcentration of chemicals from their partition coefficients: Log (Bioconcentration factor) = 0.542 Log (Partition coefficient) + 0.124. The predicted values for biomagnification apply to a specific test procedure and have been used primarily to compare various new chemicals. In interpreting the bioconcentration factor for any chemical it must be remembered that metabolism for the agent may be a very active process, consequently the total amount of material in the ecosystem is constantly being reduced while the ratio between the fish and the environment will remain relatively fixed. (See also W77-01310) (Auen-Wisconsin)
W77-01312

STRUCTURE-ACTIVITY RELATIONSHIPS IN FISH TOXICOLOGY,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
V. Zitko.
In: International Joint Commission Symposium on 'Structure-Activity Correlations in Studies of Toxicity and Bioconcentration with Aquatic Organisms,' March 11-13, 1975, Canada Center for Inland Waters, Burlington, Ontario, p 7-24. 25 ref.

Descriptors: *Toxicity, *Chemicals, *Molecular structure, *Testing, Solubility, Organic compounds, Aquatic animals, Fish, Sorption, Food chains, Osmosis.
Identifiers: Bioconcentration, Hansch method, Toxicology.

A review of the quantitative relationships between the chemical structure and properties of organic molecules, and biological activity indicates that these relationships are a useful tool in aquatic toxicology. Correlations between the hydrophobic (lipophilic) character of small, mostly electrically neutral molecules, and their toxicity to aquatic fauna are available and are shown as equations. While substituted salicylanilides are probably the largest group of related compounds examined for fish toxicity, the data have not been quantitatively valuated in terms of free-energy related constants. The availability of numerous chlorobiphenyls makes them an attractive group for structure-activity correlation although fish metabolize most chlorobiphenyls very slowly, if at all. Aromatic and aliphatic hydrocarbons are also suitable for structure-activity correlations, as fish metabolize these compounds and shellfish accumulate them. Logically, compounds above a certain molecular weight will not be taken up by aquatic animals, but it would be of interest to determine if any generalizations on uptake-molecular weight relationships can be made. Also low water solubility compounds may not be available to fauna and this area is another subject for investigation. Determination of structure-activity relationships will supply answers about environmental effects of organic compounds but their major limitation is the choice of appropriate types of biological activity. (See also W77-01310) (Auen-Wisconsin)
W77-01313

STRUCTURE-ACTIVITY RELATIONSHIPS APPLIED,
Minnesota Univ., Duluth. Dept. of Chemistry.
R. M. Carlson, H. L. Kopperman, R. Caple, and R. E. Carlson.
In: International Joint Commission Symposium on 'Structure-Activity Correlations in Studies of Toxicity and Bioconcentration with Aquatic Organisms,' March 11-13, 1975, Canada Center for Inland Waters, Burlington, Ontario, p 57-72. 2 fig, 3 tab, 32 ref. 18050 Hik and R800675.

Descriptors: *Toxicity, *Phenols, *Analytical techniques, Daphnia, Lethal limit, Chromatography, Solubility, Sorption, Food chains, Osmosis.
Identifiers: Partition coefficient, Hansch method, Bioconcentration.

A correlation showing the dependency of the observed lethal limit-50 of a series of phenols to the free energy related terms, pi, field and resonance (F and R), has been observed for the freshwater invertebrate, Daphnia magna. A series of 14 phenols was investigated with the best correlation obtained with F and R considered to be additive terms, as shown in the following equation: Log 1/c = 0.500pi plus 0.453F plus 0.63R plus 3.73. r = 0.978. Moreover, the dominant parameter was found to be the partition coefficient, represented by the equation: Log 1/c = 0.527pi plus 3.796 r = 0.831. The implications of these results to toxicity and bioaccumulation has led to the development of a method using a permanently bonded long chain alkyl packing in a high pressure liquid chromatographic system and subsequently relating the capacity factor—the net retention time relative to the nonadsorbed time—to the partition coefficient. (See also W77-01310) (Auen-Wisconsin)
W77-01314

STRUCTURE-ACTIVITY RELATIONSHIPS OF DDT ANALOGS IN A NON-TARGET ORGANISM. LETHAL AND SUBLETHAL EFFECTS OF BROOK TROUT FINGERLINGS,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
D. R. Gardner.
In: International Joint Commission Symposium on 'Structure-Activity Correlations in Studies of Toxicity and Bioconcentration with Aquatic Organisms,' March 11-13, 1975, Canada Center for Inland Waters, Burlington, Ontario, p. 77-97. 8 fig., 18 ref.

Descriptors: *Chemicals, *Molecular structure, *Toxicity, *Mode of action, Lethal limit, Bioassay, Fish, Environmental effects, Animal pathology.
Identifiers: Sub-lethal effects.

The problems of determination of the mechanis and/or site of action of a particular chemical co pound by comparison of in vitro and in vi molecular requirements for toxicity, to provi data on receptor site specificity, and prediction the toxicity of compounds by examination of the molecular structure and properties are discusse The experimental design attempted to define wh biological parameters should be considered f structure-activity relationships, what can be e amined with any degree of accuracy, what si nificance do chosen parameters have to the su vival of the whole animal, how to relate an in vit approach to in vivo, how to confront the biologic material with known concentrations of a co pound, and, finally how to assess the significan of the effects of compounds at sublethal dos The examination centered on the effect of t DDT analogs on brook trout fingerlings, i.e., t relationship between a molecule of known pes cide properties and a nontarget organism, usi their response to temperature gradients. The co clusions underscore the necessity for choosing a propriate biological parameters as measures structure-activity relationships. Also the necessi for considering that the sublethal effect on tar and on non-target organisms, or non-toxic co pounds, might eventually produce a delayed m tality. (See also W77-01310) (Auen-Wisconsin)
W77-01315

STATISTICAL PROPERTIES OF ENVIRO MENTAL DATA: CONSIDERATIONS FO BIOACCUMULATION AND TOXICITY ST DIES OF POLLUTANTS,
Illinois State Environmental Protection Agenc Springfield.
D. J. Schaeffer, and K. G. Janardan.
In: International Joint Commission Symposium 'Structure-Activity Correlations in Studies of To icity and Bioconcentration with Aquatic Orga isms,' March 11-13, 1975, Canada Center for land Waters, Burlington, Ontario, p. 177-194 fig., 2 tab., 22 ref.

Descriptors: *Pollutants, *Toxici *Mathematical models, *Data collections, Stati cal methods, Analytical techniques, Food chai Correlation analysis.
Identifiers: *Bioconcentration, Data analys Multivariate analysis.

The usage of existing environmental data in tox ty studies and some statistical properties of su data are examined, and a technique is descri for estimating the relative magnitudes of analyti laboratory and sampling errors. In many instanc these estimates are more than adequate for dev ing better collection programs; at the very le they provide a priori information estimates wh can be used in Bayesian statistical analyses to o tain precise posterior estimates. The evaluation the significance of data must include the valid of experimental protocol, the reliability of tests used to make the measurements, the qua of the answers obtained from the data analysis their relation to the original questions, and the s nificance of the conclusions. The point made that the establishment of structure-activity re tionships does not necessarily indicate that molecular properties and the toxic responses related by a cause and effect relationship to th parameters, but only that these parameters hav high degree of usefulness in the mathematical c crimination of these properties as they pertain t data set. The Murkov-Polya Urn Models theory applied to the development of a model of po tant-induced stress on biological communit (See also W77-01310) (Auen-Wisconsin)
W77-01316

MATHEMATICAL MODELS TO DESCRI THE TIME/SPACE DISTRIBUTION OF CHE CALS IN A WATER SYSTEM,
Dow Chemical U.S.A., Midland, Mich. Functio Products and Systems.
For primary bibliographic entry see Field 5B.

77-01317

N APPROACH TO THE STUDY OF MULTI-E TOXICITY,
George Williams Univ., Montreal (Quebec). ept. of Biological Sciences.
D. Anderson.
International Joint Commission Symposium on ructure-Activity Correlations in Studies of Tox-ty and Bioconcentration with Aquatic Organ-ns,' March 11-13, 1975, Canada Center for In-nd Waters, Burlington, Ontario, p. 195-198.

escriptors: *Toxicity, *Pollutants, *Mode of ac-n, Chemical reactions.
entifiers: *Combined toxicants, *Synergism, ntagonism.

rationale for models to predict the toxicity of xtures through the derivation and use of quantal l or none) response curves of the toxic con-tuents is proposed. The rationale assumes three ncipal categories of toxic action between dis-te chemical constituents of a mixture, i.e., inde-ndent action, additive action, and interaction nergism and antagonism). Independent action is edictable on the axiom that the kinetic and namic mechanisms of each toxic element are ique and are not influenced by any other chemi-l components in the mixture. The additive action predictable on the assumption that the dynamic echanism is common to or similar for all toxic nstituents; individual toxic components may ffer in their relative potencies or efficacies but t identically on the target tissue. Consequently e quantal response curves for each constituent well as their corresponding mixture should be rallel. The interaction of toxic mixtures assumes at the kinetics and/or dynamics of a toxic con-tuent are altered in the presence of another toxi-nt, and the relative potency of a toxicant may be her enhanced or lessened in the mixture. The agnitude of the response to a mixture in which e components interact is dependent on the rela-e proportions of the constituents rather than on eir inherent potencies. (See also W77-01310) uen-Wisconsin)
77-01318

COMPARISON OF METHODS FOR THE NALYSIS OF THE RELATIONSHIP ETWEEN CHEMICAL AND BIOLOGICAL ROPERTIES OF CHEMICALS,
bbott Labs., North Chicago, Ill.
r primary bibliographic entry see Field 5A.
77-01319

OCONCENTRATION OF 14C-PESTICIDES BLUEGILL SUNFISH DURING CONTINU-US AQUEOUS EXPOSURE,
onomics, Inc., Wareham, Mass.
J. Macek, M. E. Barrows, R. F. Frasny, and B. Sleight.
International Joint Commission Symposium on ructure-Activity Correlations in Studies of Tox-ty and Bioconcentration with Aquatic Organ-ns', March 11-13, 1975, Canada Center for In-nd Waters, Burlington, Ontario, p. 119-142. 5 ., 6 tab., 12 ref.

escriptors: *Food chains, *Pesticides, ersistence, Chemicals, Osmosis, Carbon dioisotopes.
entifiers: *Bioconcentration, Depuration, ological half-life.

perimental results of the propensity of over 50 4 labeled pesticides to accumulate in bluegill, oconcentration factors, and measures of the hes depuration upon transfer to uncontaminated ter are presented. These data are compared to nilar parameters generated for certain chemicals nerally considered hazardous to aquatic osystems. A number of general observations ating to the time to establish equilibrium, the bioconcentration factor obtained, the estimated biological half-life, and the effect of the pesticide concentration on these parameters are summarized. For a great majority of the labeled pesticides, an equilibrium was reached in less than three weeks and for most pesticides, the chemical residues in the muscle of bluegill are relative short-lived provided contamination is not continuous or the exposure prolonged. Biological half-life of more than two-thirds of the labeled pesticides was less than seven days. A model ecosystem approach was also utilized for a more realistic assessment of the potential hazard for food chain contamination. The bioconcentration of 14C-residues in bluegill exposed to the same herbicide in both the fish-water system and the model ecosystem differed dramatically; this was primarily due to conversion during the aging period in the model system of the parent 14C-herbicide to 14C-degradation products with much lower propensities to accumulate and persist. (See also W77-01310) (Auen-Wisconsin)
W77-01320

TOXICITY INDEX FOR PERMITS,
National Field Investigations Center-Denver, Colo.
For primary bibliographic entry see Field 5A.
W77-01321

CALCULATION OF PARTITION COEFFICIENTS USEFUL IN THE EVALUATION OF THE RELATIVE HAZARDS OF VARIOUS CHEMICALS IN THE ENVIRONMENT,
Pomona Coll. Claremont, Calif. Dept. of Chemistry.
A. J. Leo.
In: International Joint Commission Symposium on 'Structure-Activity Correlations in Studies of Toxicity and Bioconcentration with Aquatic Organisms,' March 11-13, 1975, Canada Center for Inland Waters, Burlington, Ontario, p. 151-176. 15 fig.

Descriptors: *Chemicals, *Toxicity, *Measurement, Solubility, Molecular structure, Penetration, Chemical reactions, Solutes, Osmosis.
Identifiers: *Partition coefficients.

The partition coefficient, P, measures the energy involved in transferring a molecule of a solute from water to a non-polar solvent and is an essential parameter in the study of the effect of potentially toxic chemicals in water. The distribution of a solute between immiscible solvents--water and octanol--can be treated as though it results from three primary factors: (1) the energy required for 'hole' formation, (2) the solute-solvent interaction from permanent bond dipoles; and, (3) the solute-solvent interaction from hydrogen bonds. As these three factors operate in both octanol and water, thus it is the sum of the relative effect which determine the equilibrium between phases, i.e., the partition coefficient. Not only is the bioaccumulation factor related to the log P of the chemical, but frequently its activity within the organisms--disruption of key enzymatic processes or its metabolic fate--is log P dependent. When a high degree of confidence can be overlooked, calculated log Ps can serve very well if developed from measured values for molecular structures which contain the important 'interactive' fragments. The theoretical basis for such calculations and the significance of the differences in values from various lipid solvent systems are discussed and illustrated. (See also W77-01310) (Auen-Wisconsin)
W77-01322

A PRELIMINARY TROPHIC STATUS CLASSIFICATION OF SOME SOUTH AFRICAN IMPOUNDMENTS,
National Inst. for Water Research, Pretoria (South Africa).
D. F. Toerien, K. L. Hyman, and M. J. Bruwer.
Water SA., Vol 1 (1), p 15-23, (1975). 3 fig, 4 tab, 11 ref.

Descriptors: Water quality, Bioassay, *Algae, Nutrients, Nitrogen fixation, *Eutrophication, Phosphorus, Impoundments, Africa, *Trophic level, Classification, Algal control.
Identifiers: *South Africa, Limiting nutrients, *Algal growth.

A preliminary trophic status classification of 98 major South African impoundments was constructed using agal bioassay procedures to determine the algal growth potential and to identify the growth limiting nutrients in each impoundment. The classification procedure embodied a technique whereby the growth potential of nitrogen fixing algae was accounted for. Phosphorus was the most frequent algal growth limiting nutrient in non-eutrophied impoundments and nitrogen the most frequent in highly eutrophied ones. Because of the fixation of atmospheric nitrogen by certain blue-green algae, the control of nitrogen appears to have limited value in eutrophication control. Limiting the access of phosphorus to impoundments seems to offer a long-term solution to eutrophication problems. Urban-industrial development, giving rise to nutrient rich effluents, seems to be the major cause of eutrophication although the role of agriculture can not be negated. (South Africa)
W77-01363

THE EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS. 1. RIETVLEI DAM,
National Inst. for Water Research, Pretoria (South Africa).
D. J. Steyn, W. E. Scott, D. F. Toerien, and J. H. Visser.
Water SA, Vol 1 (2), p 45-52, (1975). 9 fig, 4 tab, 12 ref.

Descriptors: Water pollution effects, *Bioassay, Sewage effluents, Phosphorus, Algae, Seasonal, Nutrients, *Eutrophication, Pollutant identification, Impoundments, Africa.
Identifiers: *Rietvlei Dam(South Africa), Limiting nutrients.

Algal bioassay results show Rietvlei Dam to be in a highly eutrophied state. The growth of non-nitrogen-fixing algae is limited by nitrogen, and that of nitrogen-fixing algae by phosphorus. It is predicted that increased discharge of sewage works effluent will increase the eutrophication status of the dam, but an inflow with lower nutrient concentrations will reduce it. The results suggest that the control of phosphorus rather than nitrogen inputs must be considered for eutrophication control, but a more complete understanding of the chemical, physical and biological characteristics of the impoundment is required before a decision can be made as to the best methods of eutrophication control. (See also W77-01392) (South Africa)
W77-01391

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS. II. HARTBEESPOORT DAM,
National Inst. for Water Research, Pretoria (South Africa).
D. J. Steyn, D. F. Toerien, and J. H. Visser.
Water S. A. Vol. 1 (3), p 93-101 (1975). 7 fig, 3 tab, 22 ref.

Descriptors: *Eutrophication, *Bioassay, Nutrients, Nitrogen, Phosphorus, Sewage effluents, Algae, Dams, Impoundments, Africa, Water pollution effects, Pollutant identification.
Identifiers: *South Africa, *Hartbeespoort Dam(So Africa), Limiting nitrients.

Algas bioassays indicated that Hartbeespoort Dam is highly eutrophied because algal growth poten-

tials (AGP) of more than 100 mg l-1 and batch culture algal growth rates of 2, 1 d-1 were recorded. Nitrogen was the primary and phosphorus the secondary growth-limiting nutrient. Addition of secondary sewage effluents linearly increased the AGP at rates of between 7,7 and 13,0 mg l-1 per cent (v/v) effluent added. These increases could be attributed to an increase in the nitrogen content of the water by the effluent. Addition of sewage effluents did not change the identity of nitrogen as the primary growth-limiting nutrient. Dilution with water of a low nutrient content linearly decreased the AGP. Although nitrogen at present determines the magnitude of algal blooms in the dam, phosphorus control is advocated for the control of eutrophication problems in the dam. (See also W77-01391) (South Africa)
W77-01392

LIMNOLOGICAL DATA REPORT FOR THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION--U. S. GEOLOGICAL SURVEY COOPERATIVE LAKE STUDIES PROJECT,
Geological Survey, Augusta, Maine.
For primary bibliographic entry see Field 2H.
W77-01414

THE BENTHOS OF SOME SOUTHERN AFRICAN LAKES PART 3: THE BENTHIC FAUNA OF LAKE NHLANGE, KWAZULU, SOUTH AFRICA,
Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology; and Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 2H.
W77-01437

THE BENTHOS OF SOME SOUTHERN AFRICAN LAKES PART 4: THE BENTHOS OF LAGOA POELELA,
Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology; and Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 2H.
W77-01438

THE BENTHOS OF SOME SOUTHERN AFRICAN LAKES PART 5: THE RECOVERY OF THE BENTHIC FAUNA OF ST LUCIA LAKE FOLLOWING A PERIOD OF EXCESSIVELY HIGH SALINITY,
Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology; and Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 2H.
W77-01439

ENRICHMENT WILL MAKE US POORER, (VERRYKKING GAAN ONS ARMER MAAK),
National Inst. for Water Research, Pretoria, (South Africa).
For primary bibliographic entry see Field 5G.
W77-01456

ENERGY DISPERSIVE X-RAY ANALYSIS (EDAX) AS AN AUTOPSY TECHNIQUE FOR COPPER-CAUSED FISH MORTALITY,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-01460

COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES, VOL. III, ANNOTATED BIBLIOGRAPHY OF STATE DATA AND INFORMATION SOURCES,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 5A.
W77-01494

METHANE, CARBON DIOXIDE, AND DISSOLVED SULFATE FROM INTERSTITIAL WATER OF COASTAL MARSH SEDIMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5B.
W77-01495

ACTION OF THREE PRESUMABLY ETOCRINE SUBSTANCES (RIBOFLAVIN, GLUTAMIC ACID, GLYCINE) ON THE KINETICS OF EGG DEVELOPMENT AND LARVAL GROWTH IN TWO SPECIES OF ECHINOIDS, ARBACA LIXULA AND PARACENTROTUS LIVIDUS). ACTION DE TROIS SUBSTANCES SUPPOSEES ECTOCRINES (RIBOFLAVINE, ACIDE GLUTAMIQUE, GLYCINE) SUR LA CINETIQUE DU DEVELOPPEMENT DE L'OUEF ET AL ROISSANCE DE LA LARVE DE DEUX ESPECES D'ECHIINIDES, ARBACIA LIXULA ET PARACENTROTUS LIVIDUS,
Institut Oceanographique, Paris (France).
J. F. Pacillon.
Marine Biology, Vol. 34, p. 67-75, 1976. 1 tab., 5 fig., 16 ref.

Descriptors: *Inhibitors, Mode of Action, *Immature growth stage, *Growth rates, *Amino acids, Larvae, *Larval growth stage, Kinetics, Biochemistry, *Vitamins, *Nutrients, Enzymes, Animal physiology, Vitamin B, Laboratory tests.
Identifiers: Riboflavin, Glutamic acid, Glycine, *Arbacia lixula, *Paracentrotus(Lividus), Echinoids, Etocrine substances.

The kinetics of egg development and larval growth of the 48-hr Arbacia lixula pluteus and Paracentrotus lividus were compared in sea water and in media containing concentrations of riboflavin, glutamic acid and glycine from 0.1 microgram/l to 50 mg/l. Glutamic acid and glycine appear to significantly effect both egg and larval development and riboflavin appears to effect development in the egg only. Dissolved amino-acids tested at natural concentrations interfere in protein synthesis according to the degree of maturity of the eggs and the species. This action modifies the kinetics of the development of the egg and larval growth. Riboflavin appears to stimulate enzyme action which has no deleterious effect on pluteus growth. In high concentrations, the amino-acids could act as chelates indirectly stimulating the growth of the larva. (Katz)
W77-01496

EFFECT OF SOME PESTICIDES ON THE ABILITY OF THE FILTERATION OF EEL CULTURE USING RECIRCULATING FILTER SYSTEM, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
I.-B. Kim, and M. J. Park.
Bull Korean Fish Soc. 7(4), p 187-194, 1974.

Descriptors: *Pesticides, *Fish diseases, Control, *Cultural control, *Filters, Eels, Water pollution effects.
Identifiers: Formalin, Malachite green, Dipterex, Furanace.

When rearing fish in recirculating filter systems, some pesticides are often used for controlling various fish diseases. The pesticides are usually applied after stopping the filtration, to avoid affecting the filtering ability to bacteria in the filter system. The influence of 3 pesticide treatments: formalin, 33 ppm plus malachite green, 0.15 ppm; Dipterwx, 0.25 ppm; and furanace, 0.1 ppm, on filtering ability, expressed as the consumption rate of dissolved O2 and depletion of NH3-N during passage through the filter layer was investigated. These pesticides did not affect filtering ability.--Copyright 1975, Biological Abstracts, Inc.
W77-01497

PHYTOPLANKTON DIVERSITY AHI CHLOROPHYLL-A IN A POLLUTED ESTUA RY,
Montclair State Coll. Upper Montclair, N. J. Dept of Biology.
M. J. McCormick, and P. T. Quinn.
Marine Pollution Bulletin, Vol. 6, No. 7, p. 105 106, July, 1975. 2 fig., 1 tab., 6 ref.

Descriptors: *Phytoplankton, *Chlorophyll *Primary productivity, *Biomass, Population *Eutrophication, *Nannoplankton, Plankton Water quality, Aquatic algae, Estuaries, Analyt cal techniques, *New Jersey.
Identifiers: *Newark Bay(NJ *Diversity(Phytoplankton).

The quantity of phytoplankton in Newark Bay New Jersey as indicated by chlorophyll-a conten of the water, is low in the winter and early spring and fluctuates greatly during the spring an summer. Chlorophyll-a concentrations ar generally less than 20 micrograms/liter until Apri Between April and August, three phytoplankto blooms were indicated by chlorophyll-a concentr tions as high as 81.4 micrograms/liter. N phytoplankton diversity values indicated generall eutrophic conditions; however, there was no si nificant correlation between diversity an chlorophyll-a concentrations. A role of na noplankton in blooms is indicated. (Katz)
W77-01499

SHELL DISEASE IN CRABS AND LOBSTER FROM NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N J. Sandy Hook Lab.
J. S. Young, and J. B. Pearce.
Marine Pollution Bulletin, Vol. 6, No. 7, p. 10 105, July, 1975, 4 fig., 22 ref.

Descriptors: *Waste disposal, Environmental e fects, *Water pollution effects, *Commerci shellfish, *Lobsters, *Crabs, *Animal patholog *Diseases, *Sewage sludge, *Benthic fauna, I vertebrates, Crustaceans, Dissolved oxyge Dredging, New York.
Identifiers: *New York Bight, *Shell disea *Homerus americanus.

Dumping grounds in New York Bight receive ve large quantities of sewage sludge. Lobsters a rock crabs collected in or near the dumpi grounds sometimes show various pathologic conditions of the shell and gills. In this study t histopathology of 'shell disease,' the causati agents and its effects on respiration are discuss in connection with a possible association with t disposal of solid wastes into the ocean. (Katz)
W77-01500

ARTIFICIAL ISLANDS: INFORMATION NEE AND IMPACT CRITERIA,
Delaware Univ., Lewes. Marine Studies Center.
For primary bibliographic entry see Field 6G.
W77-01501

INCIDENCE OF SHELL DISEASE IN SHRIM IN THE NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N J. Sandy Hook Lab.
V. H. Gopalan, and J. S. Young.
Marine Pollution Bulletin, Vol. 6, No. 10, p. 14 153, October, 1975. 1 tab., 5 fig., 26 ref.

Descriptors: *Shellfish, *Animal disease *Shrimp, Diseases, Water pollution effect *Crustaceans, *Food chains, *Patholog *Infection, Environmental effects, Invertebrate Laboratory tests, Sampling, Microscopy, Analyt cal techniques, New York.
Identifiers: *New York Bight, *Shell disea Crangon spp.

idence of shell disease in shrimp is as high as 30 rcent in certain localities in the New York Bight. oss examination and histopathological prepara- ns revealed cracking and pitting of the ex- keleton, common characteristics of crustacean ll disease, followed by necrosis of underlying ue. Aquarium studies, including tests of the ef- ts of an antibiotic, indicated a possible infec- us etiology. The disease may be related to pollu- n of the habitat by organic wastes including cel- ose. (Katz)
7-01502

E EFFECT OF TWO COMMERCIAL HERBI- DES ON THE SETTLEMENT, GERMINA- ON AND GROWTH OF ENTEROMORPHA,
wcastle-upon-Tyne Univ. (England). Dept. of nt Biology.
Moss, and P. Woodhead.
rine Pollution Bulletin, Vol. 6, No. 12, p. 189- 2, December, 1975. 3 fig., 14 ref.

scriptors: *Mortality, *Lethal limit, erbicides, *Algae, *Pest control, *Aquatic ed control, *Toxicity, Mode of action, uisance algae, *Paraquat, Pesticides, Antifoul- materials, Laboratory tests, *Growth stages, ter pollution effects.
ntifiers: *Enteromorpha spp., *Amitrole.

teromorpha spp. are virulent ship fouling organ- ns. Paraquat and amitrole, two commercial her- ides, were tested as possibly effective in killing weed or as a deterrent to its initial settlement l growth. Laboratory tests indicated a complete overy of Paraquat from test cultures indicating t paraquat is absorbed by the algal cells, and eased after killing the cells. Concentrations of and 142 mg/l of paraquat was toxic to the gotes and clumped individuals were more re- tant to the herbicide than were individuals. itrole was effective at an earlier developmental ge of Enteromorpha than was paraquat. Growth s greatly reduced in amitrole solutions of 25 /l. Enteromorpha is exhibited an extremely high erance to these two pesticides. (Katz)
7-01503

E BACTERIOLOGY OF POWER STATION FLUENT USED TO FARM MARINE FISH,
iversity of Strathclyde, Glasgow (Scotland). pt. of Applied Microbiology.
Gilmour, M. F. McCallum, and M. C. Allan.
uaculture, Vol. 7, No. 4, p. 357-362, 1976. 2 ., 11 ref.

scriptors: *Fish farming, *Bacteria, seudomonas, Effluents, *Reclaimed water, ish management, Powerplants, Aquatic bac- ia, Populations, *Aquiculture, Chlorination, ermal pollution.
ntifiers: *Achromobacter, *Alcaligenes, grobacterium.

wer station effluent used in an experimental rine fish farm was analyzed for bacterial con- t. Duplicate water samples from an unstocked k and from each of four tanks stocked with rved plaice were analyzed both quantitatively l qualitatively. It was found that bacterial nts obtained from samples taken from stocked ks were significantly higher than those taken m an unstocked tank. Allowing for limited sam- g, the flora of the water circulating through an tocked tank did not differ radically from the a of the water following the addition of starved . The predominant group was the Pseu- monas Group IV/Achromobacter/ Al- igenes/Agrobacterium Group. (Katz)
7-01505

LTURE STUDIES ON THE EFFECTS FROM RATE POLLUTION ON THE GROWTH OF RINE PHYTOPLANKTERS,
heries and Marine Service, Vancouver (British lumbia). Vancouver Lab.
N. J. Antia, and J. Y. Cheng.
Journal of the Fisheries Research Board of Canada, Vol. 32, p. 2487-2494, 1975, 2 fig., 4 tab., 25 ref.

Descriptors: Environmental effects, *Phytoplankton, Water pollution sources, Water pollution effects, *Lethal limit, *Toxicity, *Bioassay, Population, *Algae, *Pulp wastes, *Adaptation, Laboratory tests, Water quality, Industrial wastes, Primary productivity.
Identifiers: *Borate, *Boric acid.

The autotrophic growth of 19 species of marine phytoplankters, from 10 classes of algae, was tested on axenic cultures with boric acid additions of 0-100 mg/liter B to a controlled seawater medium. Growth inhibition occurred in 26 percent of the species at 50 mg/liter B and in 63 percent of species at 100 mg/liter B. Both adaptation period and degree of inhibition lessened on sequential transfer of certain species from lower to higher boron concentration. These results predict that, in the absence of stress from nutrient deficiency and adverse pH conditions, inorganic borate pollution would be tolerated by phytoplankton up to 10 mg/l B while concentrations up to 100 mg mg/l B would cause species redistribution. (Katz)
W77-01506

TOXICITY OF 30-MINUTE EXPOSURES OF RESIDUAL CHLORINE TO THE COPEPODS LIMNOCALANUS MACRURUS AND CYCLOPS BICUSPIDATUS THOMASI,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
D. L. Latimer, A. S. Brooks, and A. M. Beeton.
Journal of the Fisheries Research Board of Canada, Vol. 32, p. 2495-2501, 1975, 2 fig., 3 tab., 16 ref.

Descriptors: *Bioassay, *Chlorine, *Chlorination, *Toxicity, *Lethal limit, Effluents, *Cooling water, *Copepods, *Plankton, *Temperature, Water treatment, Water quality control, Water pollution sources, Power plants, Aquatic life, Thermal pollution, Water pollution effects.
Identifiers: *Limnocalanus spp., *Cyclops spp.

Laboratory bioassays were conducted at 5, 10, 15 and 20 C to determine the toxicity of residual chlorine, as might be found in power plant cooling waters, to two copepods. The 30-minute TL50 was 1.54 mg/l for Limnocalanus macrurus at 5 and 10 C. For Cyclops bicuspidatus thomasi, the 30-minute TL50 values at 10, 15 and 20 C were 14.68, 15.61 and 5.76 mg/l, respectively. Predicted safe concentrations, using 5 percent mortality for 30-minute exposures were 0.9 mg/l for L. macrurus and 0.5 mg/l for C.b. thomasi. These concentrations roughly coincide with the maximal chlorine levels characteristic of most power plant effluents. (Katz)
W77-01507

ACUTE TOXICITY OF CHLORINE TO SELECTED ESTUARINE SPECIES,
Virginia Inst. of Marine Sciences, Gloucester Point.
M. H. Roberts, Jr., R. J. Diaz, M. E. Bender, and R. J. Huggett.
Journal of the Fisheries Research Board of Canada, Vol. 32, p. 2525-2528, 1975. 1 tab., 6 ref.

Descriptors: Sewage treatment, *Chlorine, Laboratory tests, *Bioassay, *Toxicity, *Molluscs, *Larvae, *Lethal limit, *Water quality, *Estuaries, Water pollution effects, Disinfection, Oysters, Clams, Copepods, Shrimp, *Pollutant identification.
Identifiers: *Acartia spp., Crassostrea spp., Mercenaria spp.

Two flowing water systems designed to test the acute toxicity of chlorine in estuarine water are described. One is adapted for microscopic species and the other for larger species. Acute toxicity results for several invertebrate and fish species are presented. Molluscan larvae and Acartia tonsa were the most sensitive species tested, with 48-h TL50 values less than 0.005 ppm. (Katz)
W77-01508

THE EFFECT OF THE PRELIMINARY ADAPTATION TEMPERATURE ON THE DISTRIBUTION OF JUVENILE COD (GADUS MORHVA) AND POLLOCK (POLLACHIUS VIRENS) WITHIN A TEMPERATURE GRADIENT,
Murmanskii Morskoi Biologicheskii Institut (USSR).
Y. V. Tat'yankin.
Journal of Ichthyology (English Translation) Vol. 14, No. 5, 1975, p 755-760, 2 fig, 3 tab, 16 ref. Translated from Russian.

Descriptors: *Environmental effects, *Adaptation, *Temperature, Fish, Laboratory investigations, Juvenile fish, *Distribution, Water pollution effects.
Identifiers: *Cod, *Pollock, Gadus morhua morhua, Pollachius virens.

The study was conducted in the years 1967-1969 on cod and pollock underyearlings in August-September and on yearlings and 2 year old fish in January-February. The temperature was altered by approximately 8 C so that the fish were exposed to winter temperatures in the summer and to summer temperatures in the winter. The temperatures selected by the fish under temperature gradient conditions were dependent on the temperature of the preliminary adaptation with the zones of selected temperatures being in the same direction as the action of the adaptation temperature. Dependence on the temperature of preliminary adaptation was related to the specific and age characteristics of the fish. The adaptation process is completed most rapidly in older cod by comparison with younger pollock and cod of the same age. Adaptation was more rapid to high than to low temperatures. (Chilton-ORNL)
W77-01509

LARVAL CONTRACAECUM (NEMATODA, ANISKIDAE) IN THE PERICARDIUM OF FISHES FROM EAST AFRICAN LAKES,
Hebrew Univ., Jerusalem (Israel). Heinz Steinitz Marine Biology Lab.
I. Paperna.
Proc Helminthol Soc Wash. 41(2), p 252, 1974.

Descriptors: *Fish parasites, *Worms, Nematodes, Africa, Lakes, *Tilapia.
Identifiers: *Anisakidae, Bagrus-docmac, Contracaecum, Haplochromis-spp., *Lake George, Tilapia-nilotica, *Lake Victoria.

Contracaecum worms were found in the pericardial cavity of Tilapia nilotica (in 35% of 78 fish) and in Haplochromis spp. from Lake George (in 0.4% of 487 fish) and N. Lake Victoria (in 1% of 184 fish), and in Bagrus docmac from Lake George (in 2% of 47 fish). Anatomical characteristics of the worms are described. Usually, only 1 worm was found per infected fish. None of the infected T. nilotica showed signs of emaciation, but some Haplochromis were emaciated.--Copyright 1975, Biological Abstracts, Inc.
W77-01545

ENVIRONMENTAL POISONS.
Svenska Naturskyddsforeningen: Stockholm, Sweden. 1974. 32 p, Landell, Nils-Erik (Ed.).

Descriptors: *Industrial wastes, *Pesticide toxicity, *Law enforcement, *Regulation, *Herbicides, *Pesticides, *Insecticides, *Water pollution sources, *Fish, *Wildlife, *Poisons, Metals, DDT, DDD, Aldrin, Dieldrin, Polychlorinated biphenyls, Fungicides, Seed treatment, Mercury, Plankton.

Identifiers: Malathion, Parathion, Pyrethrum, Sweden, Food concentrations, Methylmercury, Phenylmercury.

The damaging effect of modern industrial poisons (biocides) is reviewed in light of the present laws in Sweden regarding DDT, DDD, polychlorinated biphenyls, aldrin, dieldrin, herbicides, phosphate insecticides (parathion, malathion, etc.), and pyrethrum. The accumulation of DDT, DDD and polychlorinated biphenyls in the food cycle of plankton, fish and mammals is discussed. In Sweden, the use of methylmercury as a seed disinfectant from 1940-1966 and the use of phenylmercury by the forest products industries proved particularly destructive to birds and produced a high Hg content in fish. Tolerable food concentrations of biocides and metals and the concentrations actually found in human organs and in animals, birds and fish are given. In Sweden, 4000 tons of biocides are used yearly, 75-80% herbicides, 6-8% insecticides and the rest fungicides. The State Nature Protection Department has supervised the production of biocides and their use since July 1973. The State Food Authorities also take part. A summary of study material on the damaging effects of biocides provided by the Swedish Society for the Protection of Nature and a bibliography conclude the booklet.—Copyright 1975, Biological Abstracts, Inc.
W77-01547

5D. Waste Treatment Processes

AN EXPLORATORY STUDY OF POSSIBLE ENERGY SAVINGS AS A RESULT OF WATER CONSERVATION PRACTICES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 3E.
W77-01052

A FEASIBILITY/DEVELOPMENT STUDY FOR THE REMOVAL OF AMMONIA FROM WASTEWATER USING BIOLOGICALLY REGENERATED CLINOPTILOTITE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
M. J. Semmens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 512, Price codes: A08 in paper copy, A01 in microfiche. Research Report No. 115, Illinois Water Resources Center, Urbana, August 1976. 141 p, 49 fig, 8 tab, 62 ref. OWRT A-080-ILL(1), 14-31-0001-6014.

Descriptors: *Waste water treatment, *Nitrification, *Ion exchange, *Heavy metals, Biological treatment, Nitrogen, Salts, Toxicity, Recycling, Nitrogen fixing bacteria, Barium, Lead, Copper, Cadmium, Zinc, Costs.
Identifiers: *Ammonia removal, *Regeneration, *Clinoptilotite, Ammonium nitrogen.

Ammonium nitrogen may be readily removed from wastewaters by means of an ammonium selective ion exchanger, clinotpilolite. The major cost in this process is the cost of regenerating the exchanger in order that it may be reused. Results are presented of a study to develop a process in which nitrifying bacteria were employed to regenerate the exchanger. The biological regeneration process is shown feasible in both batch and column studies. The mechanism of regeneration was ion exchange followed by nitrification of the liberated ammonium. The influences of salt concentration, salt composition, particle size, dissolved oxygen, aeration tank configuration, and aeration tank size on the rate of regeneration were identified. The selectivity of clinoptilolite for barium, lead, copper, cadmium and zinc was measured in exchange for sodium. To further identify possible toxic effects of heavy metals toxicity studies were conducted with free and complexed copper.
W77-01057

A SOLUTION PROCEDURE FOR THE DESIGN PROBLEM OF A MULTIPLE TREATMENT PLANT SYSTEM ALONG A STREAM,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
D. Panagiotakopoulos.
Working Paper, UESE 76-12, Department of Civil Engineering and Applied Mechanics, McGill University, Montreal, Canada, May 1976. 5 fig, 5 tab, 10 ref.

Descriptors: *Liquid wastes, *Treatment facilities, *Methodology, *Linear programming, Optimization, Dynamic programming, Decision making, Networks, Streams, Efficiencies, Operations, Dissolved oxygen, Standards, Hudson River, Constraints, Mathematical models, Systems analysis, Equations, *Design, Criteria.
Identifiers: *Cost minimization.

The design problem of liquid waste treatment plants in a multiplant system along a stream entails the selection of a sequence of unit operations for each plant, as well as the determination of each operation's waste removing efficiency, so that the dissolved oxygen standards along the stream are met at minimum cost. The suggested solutions have so far been partial and suboptimal since they consider only the efficiencies on a fixed sequence of unit operations, neglecting the question of choice among them. This paper outlines an efficient two-phase procedure for completely solving this multi-plant system problem by determining for each plant both the best set of operations and their efficiences. First, a network algorithm is developed for generating concave cost-efficiency curves for each plant such that each plant efficiency level corresponds to the optimal rather than to a pre-specified fixed sequence of operations. Second, a linear programming model with concave and separable objective function is employed for allocating treatment requirements among the plants. The procedure is compared with existing ones through an application to a real case. (Bell-Cornell)
W77-01165

COAL AND THE ENVIRONMENT, ABSTRACT SERIES, MINE DRAINAGE BIBLIOGRAPHY, 1910-1976.
Bituminous Coal Research, Inc., Monroeville, Pa.
For primary bibliographic entry see Field 5G.
W77-01192

PROCESS FOR EXTRACTING DISSOLVED SALTS FROM WATER,
Dames and Moore, San Francisco, Calif. (Assignee).
For primary bibliographic entry see Field 3A.
W77-01198

APPARATUS FOR TREATING LIQUIDS,
Uddeholms A. B., Hagfors (Sweden). (Assignee).
B. H. Nilsson.
U. S. Patent No. 3,968,038, 7 p fig, 6 ref; Official Gazette of the United States Patent Office, Vol 938, No 1, p 249, July 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Water pollution control, Water quality control, Filtration, Filters, Resins, Ion exchange, Water purification, Pulp and paper industry, Equipment.

The apparatus was developed primarily for use in connection with purifying waste-water from woodpulp and paper mills. Purification of wastewater by passing the water through a particulate bed in a column or tank is usually carried out cyclically, with purification phases alternating with phases in which the bed is backwashed so as to be regenerated or cleansed from the captured impurities. on changing over to the purification phase from the backwash phase a 'tail effect' occurs, resulting in pollution of the purified water by impurities from the preceding backwash phas remaining in the liquid collecting and distributi compartment in the tank bottom structure. This la or slow response of the apparatus and the resulti 'tail effect' are proportional to the volume of t tank bottom compartment. The object of this i vention is to reduce the tail effect by providing tank bottom structure that has a small volume. Th liquid treating apparatus is provided with a tank which the bottom structure is comprised of upp and lower bottom plates which are perforated a define between them the bottom compartme which is connected with the filter bed throu openings in the upper bottom plate. The liqu withdrawal or supply pipes are through openin in the lower bottom plate. The apparatus has e cellent strength and the volume of the botto compartment can be substantially reduced witho consequent reduction of the capability of the b tom structure to support heavy beds. (Sinh OEIS)
W77-01210

METHOD AND APPARATUS FOR THE PURI CATION OF A LIQUID CONTAMINATI WITH RADIOACTIVE SUBSTANCES,
Luwa A. G., Zurich (Switzerland). (Assignee).
H. Mende.
U.S. Patent No. 3,969,194, 8 p, 7 fig, 4 ref; Offic Gazette of the United States Patent Office, V 948, No 2, p 641, July 13, 1976.

Descriptors: *Patents, *Waste water treatme *Radioactive wastes, *Water pollution sourc *Water purification, Water pollution treatme Evaporation, Mixing.
Identifiers: Washing.

A method of and apparatus for the purification a liquid contaminated with radioactive substanc is described. The liquid is infed to an evaporator or with which there is connected a column hav a multiplicity of superposed plates or floors. T vapor generated in the evaporator is guid through a washing or scrubbing liquid uniform distributed at the floors and flowing in crossw counterflow with regard to the vapor. The wash liquid at the floors is deflected a number of tim in such a manner that the washing liquid itself together with the droplets entrained by the va is uniformly admixed and the washing liquid s jected to a constant intake of the radioactive s stance. (Sinha-OEIS)
W77-01216

WASTE WATER TREATMENT,
Swift and Co., Chicago, Ill. (Assignee).
E. R. Ramirez.
U. S. Patent No. 3,969,203, 5 p, 5 ref; Offi Gazette of the United States Patent Office, 948, No 2, p 644, July 13, 1976.

Descriptors: *Patents, *Waste water treatme *Industrial wastes, *Organic wastes, *Oily wa *Water pollution treatment, Water pollution c trol, Water quality control, *Electrodes, Bubb Froth flotation, Coagulation, Water reuse.
Identifiers: Packinghouse operations wastes.

Industrial waste water containing suspended p ticls such as mineral oil, fats, proteins, glyceri fibers, and biodegradable material is treated by posing the water to a number of positive and ne tive electrodes. High current densities are use create large volumes of microbubbles which fl the particles to the surface. The current is rever periodically to keep the cathodes clean. (Sin OEIS)
W77-01217

METHOD FOR USING MACROAM POLYMERS AS FLOCCULATING AGENTS,
Chemical (B. R.), Co. Ltd., Tokyo (Jap (Assignee).
I. Shinohara, and J. Aoyagi.

S. Patent No. 3,969,239, 8 p, 2 fig, 6 tab, 4 ref; ficial Gazette of the United States Patent Of-e, Vol 948, No 2, p 655, July 13, 1976.

escriptors: *Patents, *Waste water treatment, ndustrial wastes, *Water pollution treatment, Vater purification, *Flocculation, Coagulation, emical reactions, Organic compounds, olymers, Ions.

a process for treating water to remove dissolved d suspended impurities such as metallic ions, ntonite or dye stuffs, an effective amount of a ter soluble linear macroamine polymer is dis-lved in the water. The water-soluble croamine polymer is used as a flocculating or agulating agent in clarifying, precipitating and coloring water. The polymer is one having at st about 65 mol per cent amine content and not eater than about 23 mol per cent polyene con-nt. The process for preparing the polymer is scribed. (Sinha-OEIS)
77-01218

IROMIUM REMOVAL AND RECOVERY OCESS,
nningham (John), Portsmouth, Ohio (Assignee).
J. Feltz, and R. Cunningham.
S. Patent No. 3,969,246, 6 p, 1 fig, 4 tab, 4 ref; ficial Gazette of the United States Patent Of-e, Vol 948, No 2, p 657-658, July 13, 1976.

escriptors: *Patents, *Waste water treatment, ndustrial wastes, *Chemical wastes, *Separation chniques, Water pollution treatment, Water pol-ion control, Chemical precipitation, Chemical actions, Chromium, Metals, Filtration, Water se, Hydrogen ion concentration.
entifiers: Metal recovery.

process is described for removing and recover-g chromium from waste water in the form of romic acid and/or metallic chromate salts by the ect precipitation of chromium using barium car-nate in aqueous solutions acidified with glacial etic acid at an acidic pH preferably ranging from to 4.7. This is followed by filtering the resultant romium material with an acid resistant filter edia having openings in the 2 to 4 micron size ge and acid-resistant with the pH range of 2 to proximately 5. The weight ratio of barium car-nate to chromium material contained in the ste liquid is preferably 2:1 and the preferable ight ratio of the barium carbonate to the acetic id is 3:1. The barium carbonate and acetic acid e freshly mixed in aqueous media prior to either dition to the chromium waste liquid or addition the chromium waste liquid to the freshly epared treating material in aqueous media. nha-OEIS)
77-01220

EAVY METAL ADSORBENT PROCESS,
ency of Industrial Science and Technology, kyo (Japan). (Assignee).
Terajima, S. Tomita, Y. Matsuda, and K. Abe.
S. Patent No. 3,970,553, 4 p, 3 tab, 3 ref; Offi-l Gazette of the United States Patent Office, l 948, No 3, p 1100, July 20, 1976.

escriptors: *Patents, *Waste water treatment, ndustrial wastes, *Heavy metals, *Water pollu-n treatment, Water pollution sources, Water llution control, Adsorption.
entifiers: Nitrohumic acid.

trohumic acid exhibits high adsorptivity for avy metals dissolved in water and is easily enerated by the action of an acid. However, s compound is low in mechanical strength when aped into granules. An object of this invention is provide a method of using a heavy metal adsor-nt composed predominantly of nitrohumic acid, ich is insoluble with high mechanical strength. e heavy metal adsorbent can be prepared by the lowing method. Nitrohumic acid is mixed with the carboxyl group-containing polymeric compound and the mixture is kneaded with an aqueous solution of alkali. The kneaded mixture can be first shaped into granules in a conventional manner and then subjected to an acid treatment for insolubilization, or, alternatively, first subjected to an acid treatment for insolubilization and then shaped into granules. When the heavy metal adsorbent of this invention is brought into contact with an aqueous solution containing heavy metals by a suitable means, the adsorbent adsorbs the heavy metals thus serving to eliminate heavy metals effectively from industrial effluent. The adsorbent thus used can easily be regenerated by washing with a solution of a strong mineral acid such as hydrochloric acid or sulfuric acid. (Sinha-OEIS)
W77-01226

PROCESS FOR DETOXIFICATION OF CYANIDES AND NITRILES WITH PEROXYGEN COMPOUNDS,
Deutsche Gold- und Silber-Scheideanstalt A. G., Frankfurt-am-Main (West Germany). (Assignee)
J. Fischer, H. Knorre, and G. Pohl.
U.S. Patent No. 3,970,554, 7 p 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 948, No 3, p 1100, July 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, Water pollution sources, *Water pollution treatment, Water pollution control, Water purification, Chemical reactions, Electrochemistry, Oxidation, Electrodes, Catalysts.
Identifiers: *Cyanides, Hydrogen peroxide, *Nitriles.

Waste water containing cyanides, Cyanohydrins and/or organic nitriles are detoxified by adding a peroxide compound in the presence of iodide ion or free iodine, in a given case in the presence of silver ions. Through these additions not only is the reaction considerably accelerated but it is also possible to follow and regulate the reaction potentiometrically, namely, with the help of a silver electrode and a calomel or thalamide electrode as reference electrode. The end of the detoxification reaction is indicated by a clear potential jump over several hundred millivolts which also can be used as the signal for the regulation of the hydrogen peroxide addition. Since the operation is carried out with an excess of iodide over silver, the silver is quantitatively separated from the solution as difficulty soluble silver iodide after the detoxification reaction and can recovered, reprocessed and added again. Excess iodine does not disturb the subsequent biological clarification of the waste waters, but catalyzes the breakdown. (Sinha-OEIS)
W77-01227

CONDITIONING HIGHLY RADIOACTIVE SOLIDIFIED WASTE,
Gesellshaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
W. Hild, H. Krause, K. Scheffler, H. Gusten, and E. Gilbert.
U.S. Patent No. 3,971,717, 7 p, 5 ref; Official Gazette of the United States Patent Office, Vol 948, No 4, p 1509, July 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Radioactive wastes, *Radioactive waste disposal, Radioactivity effects, Water pollution treatment, Water pollution control, Water purification, Radiation, Cooling.

Highly radioactive wastes, such as fission-product solutions resulting from processing irradiated nuclear fuels, are converted to solid, stable and substantially water-insoluble products before they are transported to a final storage location in conformance with environmental protection requirements. Highly radioactive solidified waste, incorporated in molded bodies of glass, ceramic or a basaltic mass, is introduced into waste water and/or settling or precipitated sludge from community or industrial systems (in order to sterilize, improve the filterability of and condition (a) the waste water before it is introduced into a receiving stream and (b) the sludge before it is composted) and is left to remain there until the heat energy produced by the radioactive radiation has been reduced in its order of magnitude to one tenth of the amount available in the molded bodies upon their completion. The molded bodies, which may be sheathed or coated, are alternatively introduced into raw water used for preparing drinking water in order to sterilize it and are left to remain therein until heat energy produced by the radioactive radiation has been reduced in its order of magnitude to one tenth of the amount available in the freshly prepared molded bodies. An object of the invention is to find a better way to utilize available ultimate storage locations in salt stocks and to reduce the cost of noncontaminating removal or final storage of highly radioactive waste. (Sinha-OEIS)
W77-01233

ULTRAVIOLET WATER PURIFIER,
For primary bibliographic entry see Field 5F.
W77-01234

THEORY OF STORAGE AND TREATMENT-PLANT OVERFLOWS,
C. D. D. Howard.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE4, Proceedings Paper 12310, p 709-722, August 1976. 5 fig, 5 ref, append.

Descriptors: *Runoff, *Sewage treatment, *Overflow, *Storage, *Storm runoff, Combined sewers, Economics, Hydrology, Precipitation, Storm drains, *Treatment facilities, Equations, Computer models, Waste water treatment, Performance.
Identifiers: Storage and treatment plant combination.

The effectiveness of storage in combination with a treatment plant for storm runoff depends on the capacities of the two facilities and the number, duration, and volumes of runoff events which these facilities must process. Computer simulation models can be used for direct evaluation; this paper presented a complementary theoretical method. The theory used a probabilistic description of precipitation as determined from local records and developed statistics of untreated discharge through mathematically derived probability functions. A number of important assumptions were made since it is known that such problems can be mathematically unsolvable. It was concluded that the theory is probably not a practical substitute for computer simulation, but it should provide a means for directing more detailed computer analysis towards the most cost-effective combinations of storage and treatment. (Lardner-ISWS)
W77-01335

A MUNICIPAL ENGINEER LOOKS AT WATER POLLUTION.
Public Health, Vol 75 (11), p 347-351, (1975).

Descriptors: Municipal water, Water supply sources, Drainage, Stormwater, Sewerage, Sewage treatment, Recreation, Water pollution, Water supply, Waste water disposal, *Waste water treatment.
Identifiers: South Africa, New Zealand.

A New Zealander gives his views on the functions of a City Engineer and describes his approach to pollution as regards water supply, disposal of stormwater and waste water and in the recreational use of water. He recognises that the use of water resources is a complex issue and the best solution to a pollution aspect must give due con-

sideration to the wants and wishes of the people in the whole region affected. (South Africa)
W77-01359

METALS IN URBAN DRAINAGE SYSTEMS AND THEIR EFFECT ON THE POTENTIAL RE-USE OF PURIFIED SEWAGE,
National Inst. for Water Research, Pretoria (South Africa).
J. W. Funke.
Water SA., Vol. 1(1), p 36-44, (1975). 2 fig, 7 tab, 11 ref.

Descriptors: *Heavy metals, Metals, *Biological treatment, *Water reuse, Industrial water, *Industrial wastes, *Sewage treatment, Urban drainage, *Waste water treatment, Potable water, Sewage effluents.
Identifiers: South Africa, Metal processing wastes.

Information is provided on the removal of heavy metals by biological sewage purification operations and their effect on the performance of such systems. Also discussed is the limited impact of present concentrations of heavy metals in the Pretoria, Johannesburg and Springs purified sewage effluents on the reclamation of potable and industrial water. Authorities are urged to take a realistic approach in dealing with industrial pollution problems. (South Africa)
W77-01362

THE REMOVAL OF SALT AND ORGANIC MATERIAL FROM SEWAGE EFFLUENT BY ANION EXCHANGE RESINS,
Cape Town Univ. (South Africa). Dept. of Chemical Engineering.
T. B. S. Giddey, J. W. De Kock, and A. D. Carr.
Water SA., Vol 1(1), p 24-29, (1975). 2 fig, 3 tab, 3 ref.

Descriptors: Organic matter, Nitrogen, Phosphorus, *Sewage treatment, Ion exchange, *Resins, *Anion exchange, Salts, *Waste water treatment, Chemical oxygen demand, Sewage effluents, *Desalination.
Identifiers: South Africa.

The removal of both organic material and anions from a domestic sewage effluent has been investigated using two weak base anion exchange resins. The resins are the gel-type Amberlite IRA-68 and the macroreticular-type Amberlite XE-275. Both resins are effective in reducing the COD as well as removing the anions present, though the XE-275 resin shows a higher drop in operating capacity. When linked with a cation column, total nitrogen and phosphate removals can be obtained. (South Africa)
W77-01364

DISSOLVED AIR (PRESSURE) FLOTATION - AN EVALUATION OF INTER-RELATIONSHIPS BETWEEN PROCESS VARIABLES AND THEIR OPTIMISATION FOR DESIGN,
Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering.
J. Bratby, and G. vr Marais.
Water SA., Vol 1, No. 2, p 57-69, 1975. 22 fig, 3 ref.

Descriptors: *Flotation, *Activated sludge, *Sludge treatment, Cost-benefit analysis, Economics, Design criteria, *Waste water treatment, Aeration, Optimization.
Identifiers: Sludge thickening, South Africa, *Pressure flotation, Flotation tanks.

Dissolved-air flotation applied to activated sludge mixed liquor (at a sludge age of approximately 15 d) showed that bubble-particle attachment occurred efficiently with no form of chemical addition required. Experiments conducted to determine the inter-relationships between process parameters showed that three basic relationships are necessary for design. From an economic optimisation of design variables, for lowest total cost (capital plus capitalised running costs) there is an optimum value related to the wastewater solids concentration and an optimum value related to the float solids concentration. From an economic viewpoint the saturator pressure applied is immaterial provided the recycle ratio is such that, in combination with saturator pressure, the optimum air/solids ratio is achieved. Total costs (capital plus capitalised running costs) for dissolved-air flotation systems are computed for a range of wastewater concentrations, flow rates and float solids concentrations. A design example is presented for thickening activated sludge mixed liquor to a concentration of 6%. (South Africa)
W77-01367

SOUTH AFRICAN PROCESS ELIMINATES DAM POLLUTION.
Construction in Southern Africa, Vol 19 (11), p. 65, (1975).

Descriptors: *Sewage treatment, *Nutrient removal, *Phosphates, *Nitrogen, Pollution abatement, *Waste water treatment, *Aeration, Patents.
Identifiers: *South Africa.

South Africa's Council for Scientific and Industrial Research's National Institute for Water Research has developed a process which can remove nitrates and phosphates from sewage without addition of chemicals. The removal of these nutrients from purified sewage effluents is important because their presence give rise to undesirable algae growth in natural waters into which the sewage is discharged. The process has been patented by the S A Inventions Development Corporation. Two South African companies and one American firm have already been licenced to use the process. (South Africa)
W77-01377

WATER RECLAMATION - QUALITY TARGETS AND ECONOMIC CONSIDERATIONS,
National Inst. for Water Research, Pretoria (South Africa).
L. R. J. Van Vuuren.
Water S A., Vol 1(3), p 133-143, (1975). 4 fig, 10 tab, 6 ref.

Descriptors: *Water reuse, Potable water, Water quality standards, Capital costs, Economics, Treatment facilities, Waste water treatment.
Identifiers: South Africa, South West Africa, Windhoek.

Full-scale reclamation of secondary effluents, both for industrial and unrestricted re-use, has been practised in Southern Africa for a number of years. Cost estimates for potable re-use have confirmed that a high quality water conforming to WHO Standards can be produced at a cost of some 10c/kl. Industrial re-use can produce water at competitive prices. This would offer a rational solution to the increasing demand for water. Operation of reclamation plants for potable re-use requires strict operational control from a health point of view. Risks can be greatly reduced by upgrading the performance of sewage treatment plants and by segregation of industrial toxic wastes. A better approach would be to plan new sewage treatment works as an integral part of a water reclamation system. In this regard, chemical pretreatment followed by biological denitrification and active carbon adsorption appears to be more promising. (South Africa)
W77-01440

FULL SCALE EXPERIMENTATION ON THE NEW JOHANNESBURG EXTENDED AERATION PLANTS,
Johannesburg City Health Dept. (South Africa).
H. A. Nicholls.
Water S A., Vol 1 (3), p 121-132, (1975). 20 fig, 3 tab, 7 ref.

Descriptors: Flocculation, *Aeration, Sewage treatment, Denitrification, Phosphorus, Sludge treatment, *Waste water treatment, *Treatment facilities.
Identifiers: *Johannesburg, *South Africa, *Extended aeration, Bardenpho process, Aeration tanks.

The theories of three workers were found to be correct on full scale experimentation, namely, the Marais development of the long solids, retention time concept, the Pitman development of the biological flocculation concept, the Bardenpho process developed by Barnard to remove nitrate, and lastly, the modified Bardenpho process to remove nitrate and phosphate. This paper points out the benefits derived from full scale experimentation on the above concepts. (South Africa)
W77-01441

ECONOMIC ASPECTS OF WASTEWATER TREATMENT IN SOUTH AFRICA,
Johannesburg City Health Services (South Africa).
V. N. Bolitho.
Water S.A., Vol 1 (3), p 118-120, (1975). 2 tab.

Descriptors: *Urbanization, *Waste water treatment, *Economics, Municipal water, Potable water, Sewerage, Industrial waste, *Aeration, *Treatment facilities, Construction costs.
Identifiers: *South Africa, *Extended aeration.

Rapid expansion of urban populations in South Africa will require additional waste water treatment facilities with a capacity of 10 000-12 000 Ml/d. The cost of constructing plant unit of 100 Ml/d capacity and employing the extended aeration process is estimated at R4,25m with operating cost of 2,25 c/m3. Methods of sludge disposal are changing and new cost structures will have to be taken into account. Estimated investments and running costs for waste water facilities in South Africa during the next 25 years are given. Economic considerations are discussed for the following: purifying municipal effluents to various standards of purity, including that of potable water; industrial waste treatment; and regional sewerage schemes. (South Africa)
W77-01444

SAND 'SPONGE' WILL STORE RECLAIMED WATER.
For primary bibliographic entry see Field 4B.
W77-01451

THE TREATMENT OF WASTEWATER WITH A ROTATING DISC UNIT, (BEHANDELING VAN AFVALWATER MET DIE DRAAISKYFEENHEID).
National Inst. for Water Research, Pretoria (South Africa).
Municipal Administration and Engineering, Vol 40 (480), p 68-71, (1975). 1 fig, 2 tab, 1 ref.

Descriptors: *Sewage treatment, Oxidation, Operation and maintenance, *Waste water treatment, Ammonia.
Identifiers: South Africa, *Rotating discs.

The South African Council for Scientific and Industrial Research's (CSIR) National Institute for Water Research, used a rotating disc unit (RDU) for the treatment of waste-water where carbon and ammonia had to be oxidized and nitrates had to be reduced. The RDU can be used for improving the quality of effluent from aerobic digesters and septic tanks and require minimal maintenance as no problems with foaming or change of concentration of suspended particles are experienced. The RDU is extremely suitable for the treatment of waste water from small communities. The RDU can oxidise 22 g chemical oxygen demand or 2 g ammoni

nitrogen per sq. meter per day or can be used to reduce 6 g nitrate nitrogen per sq meter per day. The power demand is approximately 2,5 W/m2. (South Africa)
W77-01455

THE EXPERIENCE WITH MONITORING WATER QUALITY IN WINDHOEK,
National Inst. for Water Research, Pretoria (South Africa).
W. H. J. Hattingh.
Suppl. Municipal Engineer, Vol. 5(5), p 39-44, (1974).

Descriptors: *Waste water treatment, *Treatment facilities, Water reuse, Economics, Water resources, Bacteria, Viruses, Water quality, *Monitoring, Sampling, Disinfection, *Pollutant identification.
Identifiers: South Africa, South West Africa, Windhoek, Chemical treatment.

A description is presented of the operation of the Windhoek waste water reclamation plant and the measures taken to ensure the production of a safe and potable water supply. The programme of vigilance testing, the reporting of results and the results of monitoring are discussed in detail. The author concludes that there is overwhelming evidence that reclamation can produce better quality water than a conventional water purification works when dealing with a polluted raw water supply. (South Africa)
W77-01457

A CASE FOR RECLAMATION,
National Inst. for Water Research, Pretoria (South Africa).
G. G. Cillie, and G. J. Stander.
Suppl. Municipal Engineer, Vol. 5(5), p 33-37 (1974).

Descriptors: Water reuse, Pollution abatement, Economics, Water resources, *By-products recovery, Public health, *Recycling.
Identifiers: South Africa, Windhoek.

The advantages of recycling water, especially in South Africa with its limited water resources, are outlined. It prevents water pollution whilst being an important water augmentation system for producing water conforming to the quality requirements for a wide range of uses and constitutes an economically attractive method of providing new water. The objections to water reclamation have generally pivoted on health considerations and stringent vigilant measures and monitoring will of necessity have to apply where reclamation for potable use is practised. Similar precautions are indeed necessary when polluted surface waters are processed for potable use. It is concluded that a serious responsibility rests upon the municipal engineer to ensure that optimum use is made of the most precious commodity - water. (South Africa)
W77-01458

TREATMENT OF SEWAGE WITH SPECIAL REFERENCE TO AERATION AND METHODS OF AERATION,
National Inst. for Water Research, Pretoria (South Africa).
W. H. J. Hattingh.
Public Health, Vol 75(1), p 3-13, (1975), 2 ref.

Descriptors: *Sewage treatment, *Aeration, Activated sludge, Filtration, Denitrification, Biological treatment, *Waste water treatment.
Identifiers: South Africa.

A general survey is given of the treatment of sewage water as it is being done in the Republic of South Africa at the present time. The treatment of sewage water by means of aeration and aeration method and new developments, like denitrification, are discussed. The biological filter-bed and activated sludge processes as examples of aerobic processes, are also discussed. (South Africa)
W77-01459

THE ECONOMICS OF HANDLING SOLID WASTES (DIE EKONOMIE VAN SOLIEDE AFVALHANTERING),
National Inst. for Water Research, Pretoria (South Africa).
D. G. S. Wolmarans.
Suppl. Municipal Engineer, 5 (5), 58-62 (1974).

Descriptors: Solid wastes, Municipal wastes, Economics, Domestic wastes, Future planning, Waste treatment, Waste disposal.
Identifiers: South Africa.

Some of the economic principles concerning the handling of solid wastes, and some possible alternative approaches, are examined. What the National Institute for Water Research has done and plans to do in this regard and how liaison with the Institute can be used to advantage. Procedures are presented for solid wastes handling methods of household, industrial, garden and street refuse as well as abattoir, plastic and agricultural wastes. The conclusions reached are: (1) municipalities must look for economic solutions to the solid wastes problem; (2) they should collect information about the costs of collection, transport and processing of solid wastes; (3) they should determine how frequently waste removal need be done, and (4) they should consider the planning of regional schemes in conjunction with their neighbors. (South Africa)
W77-01461

IMPROVED ANAEROBIC DIGESTION OF SOLID URBAN WASTE,
M. Moyal.
Municipal Administration and Engineering, Vol 41 (483), p 9-10 (1975).

Descriptors: Waste disposal, Municipal wastes, *Anaerobic digestion, Energy, Energy conversion, Resources development, *Waste treatment, *Solid wastes, Gases.
Identifiers: South Africa, Resources recovery, Bio-energy conversion.

Municipal garbage may yield 1,25 barrels of crude oil or 10,000 cubic feet of gas per ton. In this way the present cumbersome liability may be turned into an asset. Three methods that may be used for gasifying are mentioned and one of the three, anaerobic digestion is discussed in more detail. (South Africa)
W77-01462

THE ENERGY POTENTIAL OF MUNICIPAL SOLID WASTES IN SOUTH AFRICA,
Stellenbosch Univ. (South Africa). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3D.
W77-01463

PACKAGE PLANT OWNER RESPONSIBILITY AND OPERATION OF SMALL SEWAGE UNITS,
N. P. Nicolle.
Municipal Engineer, Vol 5 (4), p 27-29, (1974).

Descriptors: *Sewage treatment, Biological treatment, Aeration, Operation and maintenance, Operators, *Treatment facilities, *Waste water treatment, Filters.
Identifiers: South Africa, Extended aeration, Biological filters.

The owner responsibilities are explained in ensuring that package plant sewage treatment units operate as satisfactorily as the extravagant claims made for them by their suppliers. Both conventional biological filter type and extended aeration units are discussed and daily, as well as monthly routine checks are prescribed. A description is given as to what to expect of the operator and mention is made of maintenance requirements. (South Africa)
W77-01464

ENGINEERING ECONOMICS OF WATER RECLAMATION,
A. J. Clayton.
Suppl. Municipal Engineer, Vol 5 (5), p 53-55, (1974). 1 fig, 2 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Water resources, *Water reuse, Cost comparisons, Sewage treatment, Economics.
Identifiers: South Africa.

A detailed description is given of the operation of the Windhoek waste water reclamation plant discussing aeration, flocculation, pH correction, clarification, sedimentation and disInfection. Special attention is given to the economics of the operation and all aspects contributing to the total operating cost of 11,5C/K1 is analysed and tabulated. In conclusion it is stated that reclamation is an integral part of Windhoek's water supply and indications are that supply from this source will be increased in future. (South Africa)
W77-01466

FLOODS, A FISSURE AND A PERFECT HOLING.
For primary bibliographic entry see Field 8E.
W77-01470

SOLID-WASTES RECYCLING: APPREHENSIONS, MISAPPREHENSIONS AND DILEMMAS,
Johannesburg City Engineers Dept. (South Africa).
Val Bolitho.
Municipal Administration and Engineering, Vol 40(473), p 9-18, 35, (1975). 5 tab.

Descriptors: Solid wastes, Landfills, Economics, Incineration, Energy, *Recycling, Municipal wastes, Industrial wastes, Water reuse.
Identifiers: *South Africa.

The issue of solid-wastes-recycling is examined, and the conclusion is reached that we should have serious and growing concern about the long-term availability of resources. However, the cost of recovery from mixed wastes on a large scale is likely to be far higher than income from sales. Recovery can only be economic if the segregation involved can be done at very low cost, but local authorities cannot be expected to embark on idealistically motivated recycling if it involves incurring losses. Recycling outside the refuse circuit, contamination by refuse, fiscal measures for discouraging waste, assessment of controlled landfill and refuse as a direct heat source, are also discussed. (South Africa)
W77-01484

SEWER LINING,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 8G.
W77-01491

THE EPIDEMIOLOGY OF RECLAIMED WATER,
South West African Inst. for Medical Research, Windhoek.
S. S. Grove.
Suppl. Municipal Engineer, Vol 5 (5), p. 49-51, (1974).

Descriptors: *Waste water treatment, Water reuse, *Human diseases, *Epidemiology, Sur-

veys, *Public health, Africa, Potable water, Pollutant identification.
Identifiers: South Africa, *South West Africa, Hepatitis, Gastro-enteritis, Disease detection.

When reclamation of potable water was started in Windhoek the S A Water Research Commission requested the South African Institute for Medical Research to undertake a detailed epidemiological survey of the residents. Relevant available data is briefly discussed in the article under the headings of gastro-intestinal infections, central nervous system diseases, hepatitis and miscellaneous diseases. It is concluded that even though not enough information is available with which to compare the findings of the survey, taking past experience into consideration there does not appear to be any significant change in the occurrence of disease in Windhoek. (South Africa)
W77-01492

RULES AND REGULATIONS: CONFINED FEEDING OPERATIONS.
For primary bibliographic entry see Field 5G.
W77-01512

SULFURIC ACID FOR THE TREATMENT OF AMMONIATED IRRIGATION WATER: I. REDUCING AMMONIA VOLATILIZATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5G.
W77-01517

THE DETERMINATION OF CADMIUM, LEAD, COPPER AND ZINC IN GROUND WATER, ESTUARINE WATER, SEWAGE AND SEWAGE EFFLUENT BY ANODIC STRIPPING VOLTAMMETRY,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5A.
W77-01518

ANIMAL WASTE PROBLEMS NOW FACING THE DEPARTMENT OF NATURAL RESOURCES,
Wisconsin Dept. of Natural Resources, Madison. Industrial Waste Water Section.
For primary bibliographic entry see Field 5G.
W77-01525

MANURE DISPOSAL, POLLUTION CONTROL, AND THE NEW YORK DAIRY FARMER,
Cornell Univ., Ithaca, N. Y. Dept. of Agronomy.
D. R. Coote, and P. J. Zwerman.
New York's Food and Life Sciences Bulletin, No. 51, Physical Sciences: Agronomy, No. 3, April, 1975, 19 p. 3 tab, 100 ref.

Descriptors: *Dairy industry, *Waste disposal, *New York, Economics, Regulation, *Farm wastes, Pollution abatement, Water pollution control.
Identifiers: *Land disposal.

Fifty New York dairy farms were visited in 1971 to investigate dairy waste management problems and farmer attitudes toward economic and environmental effects of alternative waste management methods. Two distinct types of dairy farms were noted (1) those with conventional barns (cattle stayed mostly in pasture) and (2) those with freestall barns (cattle permanently confined in barn and exercise yard or pasture). In the pasture system, cattle spread their own manure; in the freestall barn, farmers disposed of the manure. Most farmers felt that all their manure could beneficially be used in field spreading. However, some freestall farmers favored 'dumping' of manure on fields, regardless of environmental effects. Existing regulations that limit pollution by dairies are discussed. Other possible legal approaches are: (1) Restrict the manure amounts to be spread on an area in one year, (2) Restrict manure spreading to soils that are not excessively permeable or excessively impermeable, (3) Restrict manure spreading to flat or only gently-sloping fields, (4) Restrict manure spreading to areas greater than some acceptable distance from surface water capable of leaving the operator's property, (5) Restrict the housing of animals and the spreading of manure to areas greater than some acceptable distance from dwellings and public areas, (6) Restrict manure spreading to certain times of the year, (7) Require that a certain minimum land area be zoned and controlled by the farm operator according to the quantity and type of animals kept, (8) Require that any form of manure disposal, other than land application meet the same controls and standards as those required for industrial or municipal effluent disposal, (9) Require that manure managing be such that no disease, odor, insect, or rodent nuisance is caused. (Penrod-East Central)
W77-01528

MANURE MANAGEMENT IN A 700-HEAD SWINE FINISHING UNIT IN THE AMERICAN MIDWEST: AN INTEGRATED SYSTEM INCORPORATING HYDRAULIC MANURE TRANSPORT WITH RECYCLED ANAEROBIC LAGOON LIQUOR AND FINAL EFFLUENT USE BY CORN (ZEA MAYS),
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
C. V. Booram, and R. J. Smith.
Water Research, Vol. 8, No. 12, p. 1089-1097, 1974. 5 fig, 6 tab, 20 ref.

Descriptors: *Lagoons, *Anaerobic conditions, *Irrigation, *Nitrates, *Groundwater, Hydraulic systems, Water pollution, Crop response, Waste treatment, Corn(Field), Recycling.
Identifiers: *Land disposal.

In recent years livestock production has shifted from pasturing to intensive confinement, resulting in manure management problems. In the midwestern states, anaerobic lagooning has been tested as a management method, with use of renovated waste water for hydraulic transport. Such lagoons convert mixtures of mucal, granular and fibrous solids in manure into a liquid suspension capable of being pumped, with simple, low capacity equipment. However, lagoon liquor has proven to be far too potent to discharge into a watercourse. One solution has been to employ standard irrigation equipment to discharge excess lagoon liquor to croplands. When anaerobic lagooning was first introduced, it was thought that periodic sludge removal would be necessary. However, three sludge removal surveys in a 10 year period have failed to produce evidence that such sludge accumulation occurs. Problems associated with land application of lagoon liquor have been largely due to nitrates. It has been found that annual applications of less than 280 kg N ha-1 can be made on corn with little danger of groundwater pollution and minimal effects on plant tissue. Because anaerobic lagoons are sources of odor, they should be located at least 1 km from residences. Because these lagoons are temperature dependent, they are not recommended for cold climates. Anaerobic lagoons should be as deep as local conditions allow, usually 3-9 m. A loading rate of about 0.08 kg VS m-3day-1 is recommended. Purple sulphur-fixing bacteria control H2S odors and should be encouraged by seeding from other active lagoons. (Penrod-East Central)
W77-01531

DAIRY MANURE UTILIZATION AND FIELD APPLICATION RATES,
For primary bibliographic entry see Field 5B.
W77-01532

LIVESTOCK WASTE MANAGEMENT WITH POLLUTION CONTROL.
North Central Regional Research Publication 222, June, 1975, 89 p. 45 fig, 58 tab, 277 ref. $2.00. J. R. Miner and R. J. Smith, eds.

Descriptors: *Farm wastes, *Feed lots, Biological properties, Chemical properties, Physical properties, Separation techniques, Waste treatment, Byproducts, Transportation, Odor, Dusts, Agricultural runoff, Aerobic treatment, Anaerobic treatment, Recycling, *Waste treatment.
Identifiers: *Waste management, Land application, Refeeding.

The aspects of livestock waste management described in this report reflect the variations encountered across the 13 states of the North Central Region. The main objective of this report is to present information on waste management that will free a livestock producer from unnecessary labor, yet, at the same time, will allow him to operate within the confines of current environmental legislation. The NC-93 committee recognizes that such an objective alone is inadequate; hence, there are large sections of the report devoted to by-product recovery. The report summarizes the necessary features of any livestock waste-management system and presents basic information on manure production and content. The effect of housing on livestock-waste management is discussed in terms of roofed facilities and unroofed facilities. Air pollution by gases and dust is regarded of such importance that one whole section is devoted to this topic. Conventional biological waste stabilization is discussed in two sections on aerobic and anaerobic treatment. The section on utilization attempts to analyze manure processing technology for harvesting useful by-products. Some of the topics discussed include land application with crop production, hydroponics, composting, production of livestock feed supplements, and pyrolysis. The report culminates with two sections on information retrieval and technical terms encountered in livestock waste management. (East Central)
W77-01534

AGRICULTURAL WASTE MANAGEMENT FIELD MANUAL.
Soil Conservation Service, Washington, D. C.
August, 1975, 345 p. 63 fig, 55 tab.

Descriptors: Agriculture, *Legal aspects, *Regulation, *Water pollution, *Air pollution, *Water quality, *Waste water treatment, Solid wastes, Agricultural runoff, Chemical properties, Livestock, Poultry, Crop response, Geology, Fish, Liquid wastes, Solid wastes, Lagoons, Waste treatment, Waste storage waste disposal, Food processing wastes, Pesticides, Equipment, Monitoring, Sampling.
Identifiers: *Waste management, Land disposal.

This manual presents information, data, and guidelines for planning, designing, and operating agricultural waste management systems. It is intended for use by field offices of the U. S. Soil Conservation Service (SCS). It supplements but does not supersede national or state standards, specifications, or requirements of SCS as they pertain to various conservation practices. Topics considered are: (1) Laws, rules, and regulations, (2) Water quality, (3) Municipal waste water treatment, (4) Waste characteristics, (5) The role of soils in waste management, (6) The role of plants in waste management, (7) Geologic considerations in waste management, (8) Fish and wildlife aspects of waste management, (9) Livestock and poultry waste management systems, (10) Food processing waste management systems, (11) Land application of wastes, (12) Waste management system components, (14) Pesticides and other chemicals, (15) Waste management equipment, (16) Monitoring and Sampling. Conversion factors and tables are also supplied along with a glossary of terms. (Merryman-East Central)
W77-01535

ATER QUALITY AND MANAGEMENT HARACTERISTICS OF FEEDLOT RUNOFF OLDING PONDS,
inois Univ., at Urbana-Champaign. Dept. of gricultural Engineering.
C. Dickey, and D. H. Vanderholm.
esented at the 1975 Winter Meeting, American ciety of Agricultural Engineers, Chicago, Il-ois, December 15-18, 1975, Paper No. 75-4568, p. 6 fig, 3 tab, 8 ref.

escriptors: *Water quality, *Feed lots, gricultural runoff, *Illinois, Rainfall-runoff lationships, Nitrogen, Phosphorus, Potassium, arm wastes.
entifiers: *Holding ponds, Land application.

study was initiated in 1974 to evaluate installed noff control facilities in terms of their manage-nt requirements, operator acceptability, and ir effectiveness in preventing water pollution. commercial livestock operations in central and rthern Illinois--beef, dairy, and swine facilities--re monitored for two years. This paper reports findings directly related to characteristics and nagement of the holding ponds. Each runoff ntrol system consisted of a concrete settling sin with a gravity-drain or a pumped outlet, lding pond, and pumping equipment for holding-nd dewatering. Rainfall and runoff data were llected at all the locations. Five holding ponds re sampled monthly; the sixth was sampled ekly. It was found that the quality of holding-nd water is highly variable. Large variations in rogen, phosphorus, and potassium concentra-ns in the water were observed. Nitrogen con-ntration exhibited a definite seasonal trend: low ncentrations during the summer months, in-easing in late fall and winter, reaching a peak in e winter, and decreasing in the spring. It was ncluded that major factors affecting holding-nd water quality are the management of the lot rface, the number of animals in the system, and anges in annual rainfall patterns. In order to gain timum nutrient benefits, dewatering of the hold-pond should occur in the spring. However, de-tering in the fall is still recommended in most uations to provide capacity for winter runoff rage. (Cameron-East Central)
7-01537

VESTOCK AND POULTRY WASTE SPOSAL CONTROL,
rth Carolina Agricultural Extension Service, leigh.
r primary bibliographic entry see Field 5G.
7-01538

ECOLOGICAL BLUEPRINT FOR TODAY.
rnal of Environmental Health, Vol. 34, No. 1, 0-39, July-August, 1971. 6 fig, 3 tab, 3 ref.

scriptors: *Waste disposal, Sampling, Chemical perties, Physical properties, *Farm wastes, cycling, Application rates, *Waste treatment.
ntifiers: *Land disposal, *Spray irrigation.

e recycling of human effluent and animal waste spray irrigation was discussed. Ten acres of pland and 12 acres of woodland were spray ir-ted. Disposal of liquid manure was at the rate 2 in. per week over a 10-acre tract of cropland ch is equivalent to 20 acre-in. or 544,000 gal. ekly sampling and testing from 32 stations in spray irrigation area were performed for the sence of turbidity, temperature, dissolved ox-n, phosphates, nitrates, nitrites, pH, ABS, and rides. It was found that by taking effluent n agricultural wastes of 200 cows and spray ir-ting the crops with this effluent, production tremendously improved. By utilization of the rients and the water, tonnage per acre in-sed. It was found that animals prefer nutrient-gated crops, as the plants are more succulent contain more phosphorus and other minerals n crops that are just watered. The establish-ment of a community using spray irrigation for handling sewage waste was also described. Results so far indicate that spray irrigation is an effective system. The waste is applied to croplands and woodlands instead of dumping it into streams and lakes. (East Central)
W77-01548

MANAGEMENT AND CONTROL OF BEEF FEEDLOT WASTE,
For primary bibliographic entry see Field 5G.
W77-01550

5E. Ultimate Disposal Of Wastes

BURNING WASTES AT SEA--IF THE EPA APPROVES,
For primary bibliographic entry see Field 5G.
W77-01082

DEEP WELL WASTES MAY BE WATER HAZARDS.
For primary bibliographic entry see Field 5B.
W77-01083

SLUDGE,
For primary bibliographic entry see Field 5G.
W77-01085

CONDITIONING HIGHLY RADIOACTIVE SOLIDIFIED WASTE,
Gesellshaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
For primary bibliographic entry see Field 5D.
W77-01233

SOME SOIL HYDRAULIC CONSIDERATIONS IN LIQUID WASTE DISPOSAL,
Department of Agricultural Technical Services, Pretoria (South Africa).
D. J. Van Rooyen.
Water SA., Vol 1 (2), p 83-89, (1975). 4 fig, 2 tab, 13 ref.

Descriptors: *Soil hydraulic characteristics, *Waste water disposal, Filtration, Adsorption, Groundwater, Soils, *Soil disposal fields, Water pollution, Liquid wastes.
Identifiers: South Africa.

The disposal of wastewaters on land is very intimately related to the natural hydrologic cycle, and constitutes a man-made modification of that cycle. In carrying out plans for the disposal of wastewater on land, the greatest promise is held by approaches which act in co-operation with natural hydrologic phenomena, rather than by approaches which tend in the opposite direction. Soil disposal of liquid wastes can only be considered to be satisfactory if effluent infiltrates in sufficient quantities and if processes of filtration and adsorption will purify the liquid before it can be recycled. Soil hydraulic parameters pertinent to the problem and which have a sound physical basis, have been considered in preference to empirical soil-water-relations. Both field and laboratory measurements were made of saturated and unsaturated flow regimes. These were followed by the evaluation of theoretical flow models on significant South African soils. Comparisons of the results were made in order to assess the validity of the various approaches. (South Africa)
W77-01354

URBAN SOLID WASTES ENGINEERING,
Johannesburg City Engineer's Dept. (South Africa).
V. Bolitho.
The Civil Engineer in South Africa, Vol 16 (11), p 329-341. (1974), 4 fig, 9 tab.

Descriptors: *Solid wastes, Legislation, *Waste disposal, Waste reuse, *Domestic wastes.
Identifiers: South Africa.

The collection and disposal of urban solid wastes is one of the most important yet most neglected aspects of urban engineering. The problem is complex and the operation inherently expensive. The paper defines the wastes problem, describes the essential elements of a collection and disposal system, deals with recycling of wastes, emphasizes the need for legislation and explains why the problem requires the urgent attention of engineers. (South Africa)
W77-01379

THE ECONOMICS OF HANDLING SOLID WASTES (DIE EKONOMIE VAN SOLIEDE AFVALHANTERING),
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W77-01461

SOLID-WASTES RECYCLING: APPREHENSIONS, MISAPPREHENSIONS AND DILEMMAS,
Johannesburg City Engineers Dept. (South Africa).
For primary bibliographic entry see Field 5D.
W77-01484

LIVESTOCK WASTE MANAGEMENT WITH POLLUTION CONTROL.
For primary bibliographic entry see Field 5D.
W77-01534

AGRICULTURAL WASTE MANAGEMENT FIELD MANUAL.
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 5D.
W77-01535

DISPOSAL OF BEEF FEEDLOT MANURE,
Texas Agricultural Experiment Station, College Station.
D. L. Reddell, and P. Lyerly.
Progress Report PR-3279C, September, 1975. 5 fig, 19 tab, 21 ref.

Descriptors: *Waste disposal, *Crop response, *Water pollution, *Groundwater, *Agricultural runoff, *Nutrients, *Soil profiles, Odor, Nitrates, Cultivation, *Farm wastes.
Identifiers: *Land disposal.

Research was conducted at the Texas Agricultural Experiment Station in El Paso to study the following: (1) the ability of various tillage equipment to plow under up to 900 tons per acre of manure and cover with sufficient soil to eliminate odors, (2) deep plowing disposal techniques for possible pollution of surface water and (3) crop quality and yields from deep plowed field plots receiving large manure application rates. In May, 1970, beef manure was deep plowed into Vinton fine sandy loam at rates of 0, 300, and 900 tons per acre wet basis. Pollution level of irrigation runoff increased with manure application rate immediately following application, but rapidly decreased to background levels within a couple of months. Soil solution extracts taken from the unsaturated manure disposal plots indicated an increase in ammonium, organic-nitrogen, COD, sodium and chloride with manure application rate. These chemical constituents peaked and in most cases were decreasing by August, 1972. Ground water samples revealed an increase in chemical constituents with manure application rate. Concentrations peaked during 1971 and reduced to background levels by August, 1972. Although significant levels of nitrate accumulate in the soils receiving large manure application, no detrimental

nitrate level occurred in groundwater samples. Denitrification must have prevented this. Yields of corn silage and forage sorghum that were grown on plots receiving up to 900 tons per acre of manure were diminished the first year. However, yields increased during the second and third years. Nitrate levels in these crops were below the nitrate toxicity levels for feeding livestock. Nitrate levels of forage grown on the 300-ton per acre plots and the 900-ton per acre plots were comparable. (Penrod-East Central)
W77-01536

LIVESTOCK AND POULTRY WASTE DISPOSAL CONTROL,
North Carolina Agricultural Extension Service, Raleigh.
For primary bibliographic entry see Field 5G.
W77-01538

LAND SPREADING OF MANURE FROM ANIMAL PRODUCTION UNITS,
Newcastle-upon-Tyne Univ. (England). Dept. of Agricultural Engineering.
J. R. O'Callaghan, K. A. Pollock, and V. A. Dodd.
Journal of Agricultural Engineering Research, Vol. 16, No. 3, p. 280-300, September, 1971. 6 fig, 13 tab, 22 ref.

Descriptors: *Computer models, *Waste disposal, *Fertilizers, Cattle, Water pollution, Farm wastes, Hogs.
Identifiers: *Land disposal, *Loading rates, Hydraulic loading, Chemical loading.

A computer simulation model has been developed to determine manure output for a group of pigs as a function of diet. The results of this model are incorporated into a second model designed to simulate land spreading of the manure. One of the factors to be considered in land spreading is the hydraulic loading of the soil; this is assessed by comparing actual evapotranspiration with historical rainfall figures and allowing the manure to make up any soil moisture deficiency. Chemical loading is determined by assessing the levels of nitrogen, potassium, and phosphorus that will be removed by the crop or fixed in the soil. Any excess applied over this figure will result in groundwater or runoff contamination. Because of increased soil saturation and decreased organic activity in cold weather, spreading during winter months is not advisable. The farmer should never apply more slurry to the soil than can be immediately absorbed. Crops also affect the maximum permissible chemical loading; intensive grass production permits the maximum loading. To plan a waste disposal system, levels of manure output and its chemical composition must be established. The hydraulic and chemical loading maximums for each field and each crop will allow the minimum acreage required for waste disposal to be calculated. By avoiding the need to purchase fertilizer, the farmer can realize cash value from his manure. For example, if a farmer fattens 5,000 hogs per year, the total cash value of the nitrogen, potassium, and phosphorus content of the manure would be 5000 pounds sterling, with spreading costs of about 1,700 pounds sterling. (East Central)
W77-01544

AN ECOLOGICAL BLUEPRINT FOR TODAY.
For primary bibliographic entry see Field 5D.
W77-01548

5F. Water Treatment and Quality Alteration

METHOD FOR USING MACROAMINE POLYMERS AS FLOCCULATING AGENTS,
Chemical (B. R.), Co. Ltd., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W77-01218

ULTRAVIOLET WATER PURIFIER,
D. N. Lambert, and R. H. Bennett.
U.S. Patent No. 3,971,947, 5 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 948, No 4, p 1579, July 27, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, *Ultraviolet radiation, Disinfection, Equipment, *Waste water treatment.
Identifiers: Germicidal effects.

An ultraviolet water purifier has a number of ultraviolet lamps mounted in a cover which extends over the purifier and above the water. A parabolic reflector directs the rays of the lamps toward the body of water. The purifier is provided with a water inlet and a baffle adjacent to it having an opening at its base to compel the water entering the purifier to flow downward and then to flow through a filter. Air bubbles are trapped by a second baffle extending from the cover to below the water level. Before the water is discharged from the purifier, a third baffle which is positioned in approximately the center of the purifier and of lower height than the body of water compels the water to flow to the surface and over the third baffle to be discharged at the end of the purifier opposite that of the inlet thereby exposing the water to the rays of the ultraviolet lamps for a maximum period and at the position at which the rays are most effective as a germicide. (Sinha-OEIS)
W77-01234

VIRUSES IN WATER, (VIRUSSE IN WATER), (IN AFRIKAANS),
Pretoria Univ. (South Africa). Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W77-01481

WONDERFUL WATER (WONDERLIKE WATER), (IN AFRIKAANS),
For primary bibliographic entry see Field 2K.
W77-01486

THE EPIDEMIOLOGY OF RECLAIMED WATER,
South West African Inst. for Medical Research, Windhoek.
For primary bibliographic entry see Field 5D.
W77-01492

5G. Water Quality Control

AN EXPLORATORY STUDY OF POSSIBLE ENERGY SAVINGS AS A RESULT OF WATER CONSERVATION PRACTICES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 3E.
W77-01052

RESEARCH TO DEVELOP ECOLOGICAL STANDARDS FOR WATER RESOURCES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6G.
W77-01054

FUTURE DIRECTION OF URBAN WATER MODELS,
Water Resources Engineers, Inc. Walnut Creek, Calif.
M. B. Sonnen, L. A. Roesner, and R. P. Shubinski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 049, Price code: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 600/2-76-058, February 1976. 86 p, 7 fig, 2 tab, 16 ref. 68-03-0499.

Descriptors: *Model studies, *Mathematic models, Analytical techniques, *Simulatio *Runoff, *Sewage systems, Computer model Hydrologic models, Waste water treatmen Urban runoff, Rainfall.
Identifiers: *Urban watershed management.

An evaluation of the future direction of urb water management modeling is presented. Curre models are reviewed, and points of possible inte face between hydrologic models and models treatment or control facilities are suggested. Co clusions are: subsystems should be simulated b fore attempting simulation or formal optimizati of connected subsystems; model users should trained and informed as to model limitations a applicability, and developers should include si plifications in order to reduce the past and curre problem of poor communication between use and developers; systematic expansion into oth urban water subsystems besides urban runo sewer systems and receiving waters should be u dertaken when developing analytic tools. Reco mendations are: models should be immediate developed in the areas of runoff transport mod ing, real-time control technology for combin sewer systems, and receiving water quali economics models; later model developme should include a reclamation/reuse routing mo for quantities and qualities of urban water, a lo period ecologic model for receiving waters and improved runoff quality smulation mod (Gentry-North Carolina)
W77-01071

STATE REGULATION OF COASTAL WAT AREA PRESERVES,
Miami Univ., Fla., School of Law.
For primary bibliographic entry see Field 6E.
W77-01072

BETTER THAN BEST: A CROSSCURRENT THE FEDERAL WATER POLLUTION CO TROL ACT AMENDMENTS OF 1972,
Cook Coll., New Brunswick, N.J.
W. Goldfarb.
Land and Water Law Review, Vol 11, p 1 (1976), 27 p.

Descriptors: *Federal Water Pollution Cont Act, *Water quality standards, *Water pollut treatment, *Legislation, *Effluents, Rivers, Wa pollution, Water law, Industrial wastes, St dards, Federal government, Administrative ag cies, Agricultural runoff, Urban runoff, Storm noff, Thermal pollution, Electric power plan Law enforcement, Regulation, Waste treatme Waste water(Pollution), Water cooling, Techno gy.
Identifiers: *FWPCA Amendments of 1972, C gressional hearings, Administrative regulations.

Prior to 1972, federal water pollution control was based on stream use classification and wa quality standards. Enforcement was difficult si it was seldom possible to pinpoint the discha responsible for lowered water quality. The Fede Water Pollution Control Act Amendments of 1 rely primarily on uniform national effluent lim tions rather than state standards. The goals of act are to achieve water of swimmable quality 1983 and zero discharge by 1985. The author ma tains that a basic conflict exists in that the b technology economically available is not suffici to attain swimmable water quality. Industries be forced to utilize tecnology that is 'better t best' with undesirable results. He recomme amending the act to provide that a cost-ben analysis be made before 'better than b technology is required. A second problem with act is in the area of thermal pollution. Stating t cooling towers may produce worse environme

roblems than discharge of heated water does, the uthor again suggests that a cost-benefit analysis e applied to thermal pollution standards. Capehart-Florida)
77-01073

ECENT DEVELOPMENTS IN THE LAW OF HE SEA: A SYNOPSIS,
or primary bibliographic entry see Field 6E.
77-01075

HE NATIONAL PERMIT PROGRAM: A POL-UTER'S BRIDGE OVER TROUBLED 'ATERS,
T. Bernbom.
oyola University Law Journal, Vol 7, p 1-31 Vinter 1976), 31 p.

escriptors: *Federal Water Pollution Control ct, *Rivers and Harbors Act, *Remedies, *Law nforcement, *Regulation, Judicial decisions, enalties(Legal), Water quality control, Water ality standards, Effluents, Federal jurisdiction, ate jurisdiction, Permits, Water law.
entifiers: *FWPCA Amendments of 1972, icenses, *Nuisance(Legal aspects), Estoppel.

hen the Federal Water Pollution Control Act nendments of 1972 were enacted, a permit stem was established for control of pollution. he permit requires compliance with federal scharge limitations and is issued by a federal gency only after state certification that state stan-rds have also been met. The amendments pro-de that compliance with permit terms is deemed give immunity from certain enforcement ac-ons, although not all. For example, the Rivers d Harbors Act of 1899, and the Refuse Act both ovideviable enforcement actions to prohibit scharges into navigable waters despite the immu-ties amendment. In addition, other actions to en-rce oil spill prohibitions apparently survive. hile a variety of estoppel and jurisdictional argu-ents may be made, permittees may find them-lves subject to federal common law nuisance, ate nuisance and state statutory enforcement of ricter pollution standards. (Comer-Florida)
77-01076

URNING WASTES AT SEA--IF THE EPA AP-ROVES,
usiness Week, No 2420, p 86R, February 23, 76. 1 p, 1 photo.

escriptors: *Ships, *Waste disposal, *Water pol-tion control, *Oceans, *Incineration, Burning, nvironmental effects, Administrative agencies, sposal, Oxidation, Wastes, Solid wastes, Ulti-te disposal, Smoke, Costs, Cost analysis.
entifiers: *Incineration ships.

cean dumping of wastes is plainly unacceptable many environmentalists. Large dead areas of e ocean have been reported by Jacques ousteau and others. However, there is presently existance an environmentally superior method at is currently gaining acceptance in the United ates. Waste-burning ships have been used in Eu-pe for some time, and the Environmental Pro-ction Agency (EPA) has just concluded tests on e feasibility of incineration at sea. It was found at there was no evidence of harm to fish or bird e in the vicinity of a burn. Shell Oil Company ed it and found that it worked, with slightly her costs than ocean dumping. The EPA, which layed and hampered Shell's first trials with ad-nistrative red tape, seems ready to permit other mpanies to use the system without any inter-ence. Problems include the cost of waste rage for some time and transportation, often in cially made containers. Nevertheless, in an er-increasing climate of hostility to ocean-mping, incineration at sea seems to be a viable rnative. (Frank-Florida)
77-01082

OF SLIME AND THE RIVER,
For primary bibliographic entry see Field 5B.
W77-01084

SLUDGE,
T. Kidder.
Atlantic, Vol 235, p 62-68, 70, April 1975. 8 p.

Descriptors: *Land use, *Sewage sludge, *Sludge disposal, *Oceans, *Water pollution treatment, Water pollution, Disposal, Waste disposal, Waste treatment, Municipal wastes, Land reclamation, Wastes, Chemical degradation, Biodegradation, New York, Hudson River, Beaches.
Identifiers: *Coastal waters.

Sludge is the end result of much of America's pollution treatment activities. Presently, cities like New York, Boston and Philadelphia are dumping their sludge into offshore waters. A twenty square mile area called the New York Bight is really no more than a dead sea. While mid-western cities like Chicago, Milwaukee, and Houston were laying their sludge productively on land to act as a soil conditioner, these eastern cities were killing large ocean areas. It seems probable that within the next few years the mass of sludge will reach the south shore of Long Island, closing down its beaches for public bathing, perhaps permanently. The solution must come from land deposits. Even though land disposal of sludge is costly, it is better than destroying fish life and plankton resources. However, it should be noted that the Environmental Protection Agency has just approved newer and deeper areas for ocean sludge dumping. (Frank-Florida)
W77-01085

URBAN STORM WATER RUNOFF: A TWO-FOLD PROBLEM,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01098

COUNTY AND MUNICIPAL POLLUTION CONTROL FACILITIES.
For primary bibliographic entry see Field 6E.
W77-01108

STATE EX REL BROWN V ROCKSIDE RECLAMATION (STATUTE PROVIDING FOR GRANTING OF PERMITS RELATING TO WATER POLLUTION CONTROL--APPLICATION).
For primary bibliographic entry see Field 6E.
W77-01114

NAVIGABLE WATERS (DEFINITION, ENUMERATION AND OFFENSES).
For primary bibliographic entry see Field 6E.
W77-01120

WATER POLLUTION PROHIBITED.
For primary bibliographic entry see Field 6E.
W77-01121

POLLUTION OF NAVIGABLE WATERS.
For primary bibliographic entry see Field 6E.
W77-01122

MILLER ANTI-POLLUTION ACT OF 1971 (ABSOLUTE LIABILITY OF PETROLEUM CARRIER).
For primary bibliographic entry see Field 6E.
W77-01123

THE ATTITUDE AND INTEREST OF THE ENVIRONMENTAL PROTECTION AGENCY IN MULTIPLE OBJECTIVE PLANNING OF WATER AND RELATED LAND RESOURCES,
Environmental Protection Agency, Washington, D.C. Office of Water Planning and Standards.
A. J. Erickson.
In: Multiple Objective Planning for Water Resources, Volume 1, Proceedings of the UCOWR Workshop on Multiple Objective Planning and Decision-Making, Natural Resources Series Number 5, Idaho Research Foundation, Inc., Moscow, 1974.

Descriptors: *Attitudes, *Planning, *Water resources, Land resources, Water quality, Management, River basin development, Waste treatment, Regional development, Economics, Social aspects, U.S. Water Resources Council.
Identifiers: *Multiple objective planning, Water programs, Cost-effectiveness.

This short paper provides a perspective of the relationships between water quality management planning, as it is being fostered, guided and assisted by the Environmental Protection Agency, and the multiple objective planning concepts identified in the 'Principles and Standards' put forth by the Water Resources Council. First is an indication of the EPA planning program, second the role of NEPA 1969, and finally the relationship to other water and related land resources planning. (See also W76-11123) (Bell-Cornell)
W77-01153

EMERGING CORPS OF ENGINEERS GUIDELINES FOR IMPLEMENTING THE PLANNING REQUIREMENTS OF WRC'S PRINCIPLES AND STANDARDS AND RELATED POLICIES,
Corps of Engineers, Washington, D.C. Planning Div.
For primary bibliographic entry see Field 6B.
W77-01154

WATER SALVAGE POTENTIALS IN UTAH, VOLUME II, EVAPORATION SUPPRESSION BY RESERVOIR DESTRATIFICATION,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2D.
W77-01164

A SOLUTION PROCEDURE FOR THE DESIGN PROBLEM OF A MULTIPLE TREATMENT PLANT SYSTEM ALONG A STREAM,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5D.
W77-01165

POLLUTER DISCRIMINANT ANALYSIS,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
D. G. Tock, and G. P. Wright.
Water Resources Research, Vol. 12, No. 4, p 613-616, August 1976. 1 fig, 3 tab, 3 ref.

Descriptors: *Water pollution control, *Data collections, Coasts, Great Lakes, Statistical methods, Mathematical models, Systems analysis.
Identifiers: *Discriminant analysis, Polluters.

A unique water pollution data base for the U.S. coastal waterways and Great Lakes that has been evolving since 1965 is discussed. The pollution statistics in this data base are used to develop a model, employing multiple discriminant techniques, to determine which pollution incident report variables will discriminate the polluter who reports his spill from the polluter who does not report his spill. The results of the analysis indicate that as few as nine out of a possible sixty variables provide reasonable discriminatory power. (Bell-Cornell)
W77-01166

EVALUATING ENVIRONMENTAL QUALITY MANAGEMENT PROGRAMMES IN WHICH DISCHARGERS ARE GROUPED,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. D. Brill, Jr., J. C. Liebman, and C. S. ReVelle.
Applied Mathematical Modelling, Vol. 1, No. 2, p 77-82, September 1976. 3 fig, 1 tab, 8 ref.

Descriptors: *Environment, *Quality control, *Management, *Evaluation, Optimization, Methodology, Algorithms, Effluents, Linear programming, Marginal costs, Water quality, Constraints, Standards, Computer programs, Mathematical models, Equations, Systems analysis.
Identifiers: Delaware estuary, Cost minimization, Non-linear formulations, Non-linear branch-and-bound procedure.

Much attention is being directed internationally to evaluating alternative programs for environmental quality management. Presented is an approach to evaluating some of the management programs in which dischargers are divided into groups and treated in a similar fashion within each group. The emphasis is on finding efficient programs for a particular geographic region where ambient environmental quality standards are used. Analogous non-linear mathematical formulations are presented for direct regulation and effluent charge programs, and a non-linear branch-and-bound solution procedure is described. A detailed algorithm is described for the effluent charge case; it is shown to be very practical in an application to data for the Delaware estuary. (Bell-Cornell)
W77-01170

ECOSYSTEM MODELS AND ENVIRONMENTAL POLICY,
San Diego State Univ., Calif. Center for Regional Environmental Studies.
For primary bibliographic entry see Field 6G.
W77-01172

NON-POINT SOURCE CONTRIBUTIONS TO WATER QUALITY PROBLEMS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-01173

THE MODELLING AND CONTROL OF POLLUTION IN A RIVER SYSTEM,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 5B.
W77-01175

WATER QUALITY CONTROL UNDER UNCERTAINTY: OPTIMAL STOPPING RULES FOR SAMPLING,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, C. C. Kisiel, and M. Beckmann.
Journal of Hydrology, Vol. 28, No. 2/4, p 331-342, February 1976. (Published in Amsterdam) 1 fig, 1 tab, 7 ref.

Descriptors: *Water quality control, *Sampling, *Water resources, *Methodology, *Optimization, Biochemical oxygen demand, Constraints, Economics, Stochastic processes, Farms, Irrigation, Salinity, Equations, Systems analysis, Mathematical models, *Risks.
Identifiers: *Stopping rules, Data networks.

One of the functions of water data networks is surveillance and control of water quality. Budgetary constraints reduce the scope of data sampling such that uncertainty about water quality parameters is a consequence. This paper considers the problem of using limited resources to control the sampling of a pollutant, such as biochemical oxygen demand (BOD), in a stream or other water bodies. In this case, BOD would be the state variable. Optimal stopping rules for sampling are developed under the constraints; such rules are desirable because of shifting social uses of the water body. The methodology recognizes that future data networks must be flexible, economical and reliable in the information they generate. The proposed formulation, which stems from modifying existing models, may be a useful framework for controlling the quality of a river or an aquifer (even air quality). An example of controlling the salinity of irrigation water taken from an available source with randomly varying salt concentration points the way toward another possible range of applications. (Bell-Cornell)
W77-01176

THE SAINT JOHN RIVER SYSTEM MODELS: A CASE STUDY,
Department of the Environment, Ottawa (Ontario). Ecological Systems Research Div.
A. K. Biswas.
Journal of Hydrology, Vol. 28, No. 2/4, p 393-406, February 1976. (Published in Amsterdam) 4 fig, 13 ref.

Descriptors: *Water resources, *River systems, *Water pollution control, *Environmental control, *Linear programming, *Simulation analysis, Optimization, Decision making, Planning, Mathematical models, Systems analysis.
Identifiers: *Saint John River(New Brunswick Canada), Policy planning.

There is an increasing awareness that with our past preoccupation with economic growth we have not given enough importance to the quality of the environment, a vital concern for water resources management. This awareness has manifested itself in the water pollution field and has precipitated the urgen necessity for developing new and better techniques to improve the quality of decisions being made in this area. A promising technique is the application of systems analysis to water resources policy planning andecision making. This article considers the state-of-the-art in mathematical modeling in this field. Discussed are models of the Saint John River System in Canada. Considered is the study area's geography and industry; the use of linear programming and simulation models is described. It is concluded that better understanding of the physical processes involved with water quality management and development of more powerful computer technology and better algorithms during the last decade or so have enables us to analyze more complex systems by means of mathematical models, thus enabling more accurate decisions. (Bell-Cornell)
W77-01178

THE GROUND WATER LEGAL REGIME AS INSTRUMENT OF POLICY OBJECTIVES AND MANAGEMENT REQUIREMENTS,
City Univ. of New York.
For primary bibliographic entry see Field 6E.
W77-01181

A SUBURBAN MODEL OF RATIONAL GROUND WATER UTILIZATION: A PLAN FOR NASSAU COUNTY,
City Univ. of New York.
For primary bibliographic entry see Field 4B.
W77-01182

COAL AND THE ENVIRONMENT, ABSTRACT SERIES, MINE DRAINAGE BIBLIOGRAPHY, 1910-1976.
Bituminous Coal Research, Inc., Monroeville, Pa.
September 30, 1976, 288 p. Compiled by V. E. Gleason and H. H. Russell EPA Grant 803189.

Descriptors: *Water pollution control, *Mine drainage, *Bibliographies, *Abstracts, Acid mine water, *Mine wastes, Mine water, *Coal mine wastes, Strip mine wastes.

This bibliography of 1,285 references has bee prepared by Bituminous Coal Research, Inc., an National Coal Association, with sponsorship o the Pennsylvania Department of Environmenta Resources and the United States Environmenta Protection Agency. This volume will be signif cantly easier to handle than the eleven separate is sues which had become an unwieldly referenc tool. Entries from the previously published Min Drainage Abstracts which are directly related t water pollution resulting from mining and prepara tion of coal are repeated here. In addition, thi volume has been updated with the inclusion o literature from 1975 and 1976 and also with newl acquired items published earlier but not previousl listed in the bibliographies. The subject areas o material listed in the bibliography cover surfac and underground mines, active and abandone mines, reclaimed surface mines, and planning o new mines. Also included are information on lake formed by surface mining, drainage from co refuse disposal areas, and water from co preparation plants. A large number of items ar concerned with effects of mine drainage on rive and streams. In addition to the abstracts, th volume includes an Author Index and a Gener Index.
W77-01192

WET COOLING TOWER WITH PLUM ELIMINATOR,
Westinghouse Electric Corp., Pittsburgh, P (Assignee).
J. O. Stephens.
U. S. Patent No. 3,965,672, 5 p, 3 fig, 3 ref; Off cial Gazette of the United States Patent Offic Vol 947, No 5, p 1942, June 29, 1976.

Descriptors: *Patents, *Cooling towers, *Wat vapor, Temperature, Velocity, Mixing, Enginee ing structures, Powerplants, Equipment.
Identifiers: Plumes, *Wet cooling towers.

Wet cooling towers, where the circulating water brought into direct contact with the air, und many weather conditions produce a plume. Th can be both a nuisance and a problem, even thou it is essentially pure water, as it often causes loc fogging and icing conditions on nearby roadwa in winter months. In order to eliminate the plu the cooling tower is encircled by an exhau header. The exhaust header is in fluid contact wi the exhaust of the gas turbines which supply h gases to the header. A number of exhaust condu are inclined upward and are generally placed ta gentially with respect to a circle in the cooli tower to thoroughly mix the hot exhaust gas with the moisture laden air, increasing its temper ture and velocity so that as the effluent mixtu emerges from the upper end of the cooling tow its buoyancy and velocity are sufficient to cause to rise into the upper atmosphere, and under mo weather conditions the effluent does not produce visible plume. (Sinha-OEIS)
W77-01193

OIL OR ORGANIC SOLVENT-ABSORBENT,
Teijin Ltd., Osalin (Japan). (Assignee).
A. Omori, I. Okamura, T. Imoto, and T. Katoh.
U.S. Patent No. 3,966,597, 8 p, 4 fig, 2 tab, 12 r Official Gazette of the United States Patent O fice, Vol 947, No 5, p 2244, June 29, 1976.

Descriptors: *Patents, *Oil pollution, *Wat quality control, *Waste water treatment, *Wat pollution treatment, Absorption, Solven *Separation techniques, Plastics, Polymers.

A description is given for an oil or organic solve absorbent for absorbing or removing oils whi have flowed onto the surfaces of the sea or rive or other bodies of water; for absorbing or remo ing waste oils discharged from industrial establis ments; or for absorbing or removing oil or orga solvent which has flowed onto any water surfa or is present in waste water in a floati

ıspended or dissolved state. It was found that a lend of polystyrene and polyethylene is highly ıitable. First an unopened, sheetlike and reticu-ted fibrous structure is made from the resinous lend. Then the blend is admixed with a foaming gent in the molten state. The resulting molten ixture is extruded through a die, quenched at the e exit to a temperature below the glass transition mperature of the blend, and drafted at a draft tio of from the maximum draft ration possible nder the operating conditions to one-third the aximum draft ratio. The sheet-formed fibrous ructures thus obtained possess numerous non-ontinuous cracks or splits along the direction of rafting. Two of the unopened, sheet-formed and ticulated fibrous structures may be superposed ith the directions of their cracks conformed to ch other, pulled in the direction perpendicular to e direction of fibers and extended. This sheet n be used as an absorbent for oils or various or-nic solvents. (Sinha-OEIS)
77-01200

PPARATUS FOR SPILLING RETRIEVAL,
. P. Kirk, and D. W. Reynolds.
S. Patent No. 3,966,613, 10 p, 12 fig, 13 ref; Of-ial Gazette of the United States Patent Office, ol 947, No 5, p 2250, June 29, 1976.

escriptors: *Patents, *Oil pollution, *Oil spills, ater pollution sources, Water pollution treat-ent, Water pollution control, *Water quality con-ol, Skimming, Separation techniques.
entifiers: Containment, Catamarans, Oil trieval.

ıe invention relates generally to the art of covering floating liquids, particularly oil slicks spillings from tankers and barges in open water. ı apparatus is provided for collecting floating uid spillings which may be pumped into tanks or nfined within retrieval sheets. A vessel is pro-ded that functions not only to deploy the sheet trieval means but also to scoop up and concen-te a quantity of the spilling before deploying the eet. The invention comprises a catamaran con-uction with spaced parallel hulls and bow and rn gates between the hulls forming a well. Each the gates is supported by the hulls for indepen-nt pivotal movement. The gates are operated in njunction with the sweeping movement of the tamaran through a body of water. A feature of e deployment well is the use of an air bubble bar-r around its periphery to assist in concentrating spilling toward the center of the well. The tamaran has a storage deck adjacent the deploy-nt well. A jib crane is located in position to liver the retrieval means to the deployment well needed. Variable ballast means are adapted to ange the draft of the catamaran according to its ight in order to ensure an optimum draft during sweeping operation. (Sinha-OEIS)
77-01202

L SPILL CLEANUP SYSTEM,
ell Oil Co., Houston, Tex. (Assignee).
R. Ayers.
S. Patent No. 3,966,614, 11 p, 14 fig, 11 ref; Of-al Gazette of the United States Patent Office, 1947, No 5, p 2251, June 29, 1976.

scriptors: *Patents, *Oil pollution, *Oil spills, ter pollution sources, Water pollution treat-nt, *Water pollution control, *Water quality trol, *Skimming, Equipment, Separation hniques.
ntifiers: Containment, Oil retrieval.

kimmer for removing oil from the surface of a ly of water is articulated from front to rear to wave comformable and/or has a quiescent col-ion zone formed by bottom and/or forward fles. A flexible skimming head for use with or ependently of the skimmer is composed of a ıminous sheet having an integral chevron flow tern on its upper surface. A floating skimming head for use similar to the preceding head has a central, axially vertically movable cone or other configuration forming a suction mouth. A boom for use with or independently of the skimmer is composed of converging double booms. Storage capacity for oil collected by the skimmer is composed of onboard and/or offboard membranes. The baffles which divide the open front end of the skimmer into separate adjacent chambers open at front and rear to permit passage of oil and water and are of sufficient length to substantially arrest orbital water particle motion associated with waves without substantially impeding flow. They also act to diffuse and downward direct water exiting from the compartment and act to create a quescent oil capture zone within the compartment. (Sinha-OEIS)
W77-01203

OIL COLLECTION BARGE,
S. L. Petchul, and R. K. Petchul.
U.S. Patent No. 3,966,615, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 2251, June 29, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution sources, *Water pollution control, Water pollution treatment, *Water quality control, Skimming, *Barges, Separation techniques, Equipment.
Identifiers: Oil collection, Containment.

The oil collection barge is a device which is intended for use in cleaning up oil spills and is especially useful where ultra large spills and adverse sea states are concerned. The device is capable of covering large areas quickly while it deals with the sea state and forces the oil floating in the path of the barge into the channel where the oil is not only contained but also rapidly concentrated. As a result of this initial concentration of the oil slick the actual separation process is made more efficient. The oil collection equipment and devices consist of a longtudinal U shaped channel with an adjustable water and oil intake funnel or wave dampner at the forward end, an oil blockage wall at the rear, an adjustable flow splitter at the rear, a water vent at the rear bottom and an adjustable vent plate at the rear bottom such that the water enters through the funnel, flows through the channel, and flows out the vent. The oil being lighter than water will enter through the funnel, flow aft in the channel, and be trapped by the blockage wall and channel sides while the water will flow through. The trapped oil is removed from the channel surface and is transferred to a holding tank by means of a spill gate, a floating suction bell and pump, or any other suitable means. (Sinha-OEIS)
W77-01204

APPARATUS FOR COLLECTING OIL SLICK FROM A BODY OF WATER,
E. A. De Voss.
U. S. Patent No. 3,968,041, 20 p, 27 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 938, No 1, p 250, July 6, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution sources, Water pollution treatment, *Water pollution control, *Water quality control, Conveyance structures, Adhesion, Separation techniques.
Identifiers: Oil slicks, Endless belts, Artificial grass.

A system for removing oil slicks from water surfaces such as the ocean, harbors, lakes or ponds uses an endless conveyor, for example, the surface of a drum or of a belt. The surface contacts the oil slick which adheres to it. The slick is conveyed by the conveyor to a means for its removal such as a wringer. The invention uses a flexible, relatively limber, flat blade-like cover for the conveyor such as the well-known artificial grass 'Astroturf'. The conveyor overhangs and presses against the top of the oil slick to that the oil can adhere to the conveyor. A second convey on aft of the first conveyor extends below the elevation of the first conveyor so that they form a wedge-shaped path in which the oil tends to be trapped and drawn. The system can be mounted to floating support means and for moving it along the oil slick. (Sinha-OEIS)
W77-01211

FLOATING SKIMMER FOR CLEANING THE SURFACE OF A BODY OF LIQUID, METHOD AND APPARATUS,
D. J. Gore.
U. S. Patent No. 3,970,556, 10 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 948, No 3, p 1100, July 20, 1976.

Descriptors: *Patents, Water pollution treatment, *Water pollution control, *Water quality control, Water pollution sources, *Skimming, Floating, Floats, Weirs, Films, Separation techniques.
Identifiers: *Skimmers, Air-borne pollutants.

The majority of the dirt and debris that gets into a body of water is airborne. Water has a surface tension which tends to retain most of this airborne dirt and debris in a relatively tough film on the very upper surface. A floating skimmer which is manually controlled to remove this contaminated film is described. The skimmer comprises an outer ring shaped body having an inner, central cavity. A flotation and ballast chamber is formed integrally in the outer body. An inlet opening in one peripheral part of the outer body admits a flow of liquid into the central cavity. The liquid in the cavity is pumped through a drain opening in the base plate. A movable weir extends across the width of the inlet opening. It is connected to the outer body along its outer edge by a hinge connection which permits articulation to regulate the quantity of and velocity liquid flowing through the opening and into the central cavity. A float on the bottom of the weir rides on the liquid within the central cavity and adjusts the level of the weir in relation to the height of the external liquid. The incoming water flowing through the opening must therefore flow over the inclined weir, and it falls off the back, inner edge of the weir in a cascade action. By maintaining the weir at the proper height, the incoming water is accelerated, and the waterfall or cascade effectively pulls the upper film from the water. Because of the acceleration produced by the inclined weir, the skimmer very quickly cleans the entire water surface around the skimmer. (Sinha-OEIS)
W77-01228

OIL FENCE,
Mitsubishi Electric Mfg. Co. Ltd., Amagasaki (Japan). (Assignee).
T. Kinase, I. Yano, K. Okubo, H. Kitakoga, and H. Tayama.
U. S. Patent No. 3,971,220, 9 p, 19 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 948, No 4, p 1342, July 27, 1976.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Water quality control, *Barriers, Floating, Structures, Equipment, *Separation techniques.
Identifiers: Oil fences, Containment.

An oil fence is described which has in combination, a longitudinally elongated, shielding screen member of flexible material; a number of rigid reinforcing strips placed at predetermined intervals on the screen member; one split float unit placed on the screen member about each of the reinforcing strips; sinkers placed at one of the longitudinal edges of the screen member through its length; and a length of reinforcing rope placed on the surface of the screen member to extend longitudinally. An improved take up apparatus is used for housing and spreading the oil fence in a simple manner and high efficiency. A box-like chamber

with attached buoys has a take-up shaft on which the oil fence can be coiled or uncoiled. (Sinha-OEIS)
W77-01230

ARE HOVERCRAFT A MAJOR CAUSE OF DISTURBANCES TO INERTIDAL INVERTEBRATES,
Institute of Terrestrial Ecology, Norwich (England). Colney Research Station.
For primary bibliographic entry see Field 6G.
W77-01263

THE COST-EFFECTIVENESS APPROACH IN ANALYZING A WATER SUPPLY PROJECT FOR THE SANTA ELENA PENINSULA, ECUADOR,
Arizona Univ., Tucson. Dept.of Hydrology and Water Resources.
For primary bibliographic entry see Field 6B.
W77-01270

SULFURIC ACID FOR THE TREATMENT OF AMMONIATED IRRIGATION WATER: II. REDUCING CALCIUM PRECIPITATION AND SODIUM HAZARD,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
S. Miyamoto, and J. Ryan.
Soil Science Society of America, Journal, Vol. 40, p 305-309, 1976. 1 fig, 6 tab, 13 ref.

Descriptors: *Irrigation operation and maintenance, *Hydrogen sulfide, *Mine wastes, *Irrigation efficiency, Water utilization, Water quality, Southwest U.S., Infiltration, Ammonia, Lime, Chemical wastes, Industrial wastes, Pollution abatement, Fertilizers.

Effects of the application of ammonia and sulfuric acid to ammoniated water on Calcium precipitation and Na-Hazard of irrigation water are evaluated theoretically, using known relations of ion equilibria, and tested with laboratory and greenhouse experiments. Results show severe precipitation of Ca2+ when ammonia is applied to alkaline irrigation water. Ammonia application also increases exchangeable Na and NH4, and can reduce water infiltration rates, especially when irrigation waters contain high Na+ relative to Mg2+ and Ca2+. Sulfuric acid applied to ammoniated water neutralizes OH- produced by ammonia application, reducing Ca precipitation and exchangeable Na. This prevents a decline in infiltration rates. Sulfuric acid, now available as a pollution abatement byproduct in the Southwest, can be used for correcting excessive lime incrustation or poor water penetration induced by the use of anhydrous or aqua ammonia without corroding irrigation systems. (Jamail-Arizona)
W77-01286

MECHANICAL CONTROL OF EURASIAN WATERMILFOIL IN MARYLAND WITH AND WITHOUT 2,4-D APPLICATION,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 4A.
W77-01289

COOPERATIVE CONTROL OF INTERNATIONAL POLLUTION AND COMMON PROPERTY RESOURCES,
University of Western Ontario, London.
J. R. Markusen.
Quarterly Journal of Economics, Vol. 89, No. 4, p. 618-632, 1975. 1 fig., 1 tab., 7 ref.

Descriptors: *Pollution abatement, *Mathematical models, *Foreign countries, *Welfare(Economics), Environmental control, Cost repayment, Taxes, Government finance, Tariff.
Identifiers: *Common property resources, *Transnational pollution, Public goods, Transfer payments.

Described is an economic model that incorporates externalities between countries and regions arising from the existence of common property resources, e.g., fisheries, oil fields, and mineral deposits lying beyond respective territorial limits, and pollution. The model represents a national policy to maximize a social welfare function with the assumption that the only tools available to this government are tariffs and subsidies. The model then attempts to solve and interpret a set of prerequisite conditions that must be satisfied by an optimal tax structure when the tax-imposing country behaves in an uncooperative fashion toward foreign planners. Then the dependence and interaction between two countries in the presence of such a bilateral externality are analyzed. The objective is to define a type of cooperative behavior and compare it to the noncooperative behavior. Of particular interest is the relationship between the set of allocations resulting from the cooperative behavior and the set of allocations that are Pareto-efficient from the world's point of view. The major finding is that a cooperative imposition of national production taxes, or any other form of cooperative output adjustment, will not guarantee Pareto efficiency, but there does exist a transfer payment in connection with a cooperative tax adjustment that will produce a Pareto solution. (Auen-Wisconsin)
W77-01290

GUIDELINES FOR LAKE WATERSHED MANAGEMENT PLANNING.
Maine Dept. of Environmental Protection, Augusta. Bureau of Water Quality Control.
Pilot Lakes Study, April 1976. 201 p. 19 fig, 10 tab, 46 ref, 4 append.

Descriptors: *Planning, *Watershed management, *Land use, *Methodology, Water quality control, Eutrophication, Evaluation, *Maine, Data collections, Phosphorus, Carrying capacity, Statistical methods, Computer programs, Environmental effects, Economic efficiency, Constraints, Competing uses, Feasibility, Social aspects, Economic impact, Institutions, Input-output analysis.
Identifiers: *User manual, Case study, Phosphorus load, Real estate development, State-of-the-art.

Information essential to planning, with the principal goal of water quality protection or improvement through control of water and related land uses, is presented. Detailed are procedures for determining goals and objectives and application of standard or improved tools and techniques. The planning process is initiated with an inventory of natural and cultural features of two Maine watersheds. Aerial photographic interpretation was complemented by on-site investigations to identify the nature and extent of natural resources and existing user patterns. A computerized data system, RIMPS (Resource Inventory Management Planning System), was developed to assist storage, retrieval and analysis of geographically oriented information. Black and white, low-level, aerial stereo photographs were used to develop a graphic base and ultimately stored in the computer. Techniques are detailed for various combinations of land and water resource elements to determine the natural suitability for particular uses and compared with existing uses to determine the current capacity for specified uses. Recommendations for corrective action are illustrated, with estimates of costs vs. benefits. Measured economic and other resource variables were combined with the assistance of RIMPS and a Trophic State Index to assess their implications for maintaining and improving water quality. Assessment of the lake as an economic resource, synthesized with water and land use suitabilities and development capacity, becomes the basis for lake watershed management plans and institutional needs. (Auen-Wisconsin)
W77-01291

COFFEE POND WATERSHED MANAGEMEN PLAN.
Maine Dept. of Environmental Protection, A gusta. Bureau of Water Quality Control.
Pilot Lakes Study, April 1976. 95 p. 29 fig., 48 ta 26 ref.

Descriptors: *Planning, *Watershed manageme *Land use, *Water quality control, *Methodolog Eutrophication, Evaluation, *Maine, Data coll tions, Phosphorus, Carrying capacity, Statisti methods, Computer programs, Environmental fects, Economic efficiency, Constraints, Comp ing uses, Feasibility, Social aspects, Economic i pact, Institutions.
Identifiers: *Residential development, *Coff Pond watershed(Maine), Pilot study, Phosphor load.

Management procedures developed by Main pilot study program demonstrate stand methods for planning a lake watershed as focu on Coffee Pond and the future development of s gle-family, detached residential dwellings wi cellars and on-site wastewater disposal subject the constraint that lake water quality (as indica by phosphorus loading only) should not degraded beyond a pre-determined level. It stressed that this is a demonstration of stand methods and is neither designed nor intended present a comprehensive plan for watersh management. Inventory analyses techniq similar to those described should also be applied such issues as industrial or recreational devel ment, development or roads and utilities, con of land use, etc. And constraints other than wa quality to be considered are community gro goals, economics, conservation of open space, The data base utilized the RIMPS (Resource ventory Management Planning System) compu programs and the input included terrestrial f tures, climate, limnology of Coffee Pond, cultu features, including existing land and water us economic data included demographic factors, dustries, dwellings and commercial property, undeveloped property; and an institutional ov view. The environmental impact of the devel ment, the carrying capacity, and the feasibility related to social, economic, and institutional f tors of the watershed are also analyzed. (Au Wisconsin)
W77-01292

FOREST LAKE WATERSHED MANAGEME PLAN.
Maine Dept. of Environmental Protection, gusta. Bureau of Water Quality.
Pilot Lakes Study, April 1976. 92 p. 31 fig., 40 t 26 ref.

Descriptors: *Planning, *Watershed manageme *Land use, *Methodology, *Water quality cont Eutrophication, Evaluation, *Maine, Data coll tions, Phosphorus, Carrying capacity, Statist methods, Computer programs, Environmental fects, Economic efficiency, Constraints, Comp ing uses, Feasibility, Social aspects, Economic pact, Institutions.
Identifiers: *Residential development, *For Lake(Maine), Pilot study, Phosphorus load.

A demonstration watershed management pl developed by a Maine pilot study and applie Forest Lake, presents examples of procedures results of a planning process. The intention i only demonstrate the standard methods develo for the pilot program and is not designed as a c prehensive management plan. The framework the evaluation and analysis focused on the su bility and capacity for the development of sin family, detached residential dwellings using cel and on-site wastewater disposal subject to the c straint that the lake water quality (as determi by phosphorus loading only) should not degraded beyond pre-determined level. planning guideline considered the watersh natural features, including fisheries and wildl

sting land uses such as transportation, recrea-
n, dwellings, industries, agriculture, and
estry; existing water uses for recreation, manu-
turing, agriculture, and service industries; the
nomic base, including value of dwellings, com-
rcial property, service industries, manufactur-
, and undeveloped property; demographic fac-
s; and an analysis of institutional structures.
sed on the foregoing data an analysis assessed
watershed's development suitability, its carry-
capacity, its feasibility, and economic value.
nomic and other resource variables were com-
ed with the assistance of RIMPS (Resource In-
tory Management Planning System) computer
grams and other planning tools. (Auen-Wiscon-
)
7-01293

SOURCE INVENTORY MANAGEMENT
ANNING SYSTEM (RIMPS). USER MANUAL,
dan (Edward C.), Inc., Portland, Maine.
S. Stees, R. E. Blake, and T. J. Churchill.
ine Dept. of Environmental Protection, Pilot
es Study, Appendix I, March 1976. 104 p. 23
, 4 ref., 2 append.

scriptors: *Computer programs, *Land use,
anning, *Methodology, Data storage and
ieval, Mapping, *Maine, Water quality control.
ntifiers: RIMPS Computer program.

MPS is a computer software package which per-
ms planning functions to enable the user to in-
tory natural resources, demographic charac-
stics, and economic data within a defined area.
displays inventoried data graphically and to
le, provides a means for ascertaining land use
tability within natural and cultural constrants,
enables the user to identify conflicts between
sting or proposed land uses and the suitability
these uses. It also provides a means for deter-
ing preferred land uses. RIMPS is composed of
computer programs labeled LANDCP (lnd
e), IRR (irregular outline), DATA (data file),
ID-1 (grid or map), and ATTR-2 (attractiveness
gram). LANDCP, IRR and DATA read in and
e inventoried resource characteristics data on
computer; these programs create the data files
use in the GRID and ATTR programs. The
ID program creates a map of the stored data,
depending upon usage, stores the map for
her use or prints out the map as the program
cutes. ATTR essentially provides the user with
ability to develop land use planning alterna-
s in a 'gaming' format. This manual gives the
iled procedure for using RIMPS. RIMPS hard-
e requirements are currently limited to disk
es, 250k memory and FORTRAN language
ed to the Control Data Cybernet System.
en-Wisconsin)
7-01294

XICITY INDEX FOR PERMITS,
ional Field Investigations Center-Denver,
o.
primary bibliographic entry see Field 5A.
7-01321

AILABILITY OF WATER FOR COAL CON-
RSION,
eau of Reclamation, Billings, Mont. Upper
souri Region.
primary bibliographic entry see Field 3E.
7-01345

VIRONMENTAL DATA MANAGEMENT,
primary bibliographic entry see Field 6G.
7-01347

TER CONFLICTS IN WESTERN COAL
VELOPMENT,
tana State Univ., Bozeman. Dept. of Civil En-
ering and Engineering Mechanics.
primary bibliographic entry see Field 3E.

W77-01349

A LABORATORY EVALUATION OF A DYE FOR THE CONTROL OF ALAGAL GROWTH,
National Inst. for Water Research, Pretoria (South Africa).
R. D. Walmsley, W. E. Scott, and D. F. Toerien.
Water SA, Vol 1(2), p 90-92, (1975). 2 fig, 3 tab, 7 ref.

Descriptors: Algae, Aquatic weed control, Light penetration, *Dyes, *Growth rates.
Identifiers: South Africa, *Anacystis nidulans, *Selenastrum capricornutum, *Algal growth control.

The principle of the use of a dye for the control of algal growth was investigated at the laboratory scale. The commercial dye employed was shown to have little effect on the growth rates of Anacystis nidulans and Selenastrum capricornutum in the laboratory at concentrations above the recommended doses. Experiments using 200 l tanks also substantiated this lack of effect on mixed phytoplankton populations. It is suggested that a dye with absorption characteristics closer to those of algal pigments might be more effectual for algal growth control. (South Africa)
W77-01355

A COMPARISON OF OIL AND FLIT MLO FOR CATCH BASIN TREATMENT,
Middlesex County Mosquito Extermination Commission, Metuchen, N. J.
R. Schmidt, E. Evans, and D. J. Sutherland.
Mosq News. 33(4), p 585-587, 1973.

Descriptors: *Insecticides, Watersheds(Basins), *Pest control, *Insect control, *Pesticides, *Oil.
Identifiers: *Culex-pipiens, *Flit-MLO.

Flit MLO performed satisfactorily in controlling Culex pipiens L. breeding in catch basins when applied at the rate of 1 oz/basin. The use of Flit MLO was slightly more economical than the use of fuel oil.--Copyright 1974, Biological Abstracts, Inc.
W77-01357

METALS IN URBAN DRAINAGE SYSTEMS AND THEIR EFFECT ON THE POTENTIAL REUSE OF PURIFIED SEWAGE,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W77-01362

URBAN SOLID WASTES ENGINEERING,
Johannesburg City Engineer's Dept. (South Africa).
For primary bibliographic entry see Field 5E.
W77-01379

CATCHMENT RESEARCH AT ZACHARIASHOEK,
Jonkershoek Forest Research Station, Stellenbosch (South Africa).
For primary bibliographic entry see Field 4D.
W77-01386

OIL-SPILL DISPERSANT FOR MARINE POLLUTION (LEKOLIEDISPERGEERMIDDEL VIR SEEBESOEDELING).
South African Bureau of Standards, Pretoria.
SABS-BULLETIN, Vol 4, (4), p 68-72, (1974).

Descriptors: *Oil pollution, *Oil spills, Beaches, Standards, *Dispersion, Toxicity, Lethal limit, *Water quality standards.
Identifiers: *South Africa.

A description is given of the first specifications for oil spill dispersant for use in dispersing crude and fuel oil floating on sea water, as well as for use in beach cleaning compiled by the South African Bureau of Standards. The specification lays special stress on dispersing efficiency, suitability for use in spray equipment and toxicity to marine life. The specification also makes provision for prohibited ingredients, such as benzines, chlorinated hydrocarbons, phenols, creosols, free caustic alkalis, mineral acids, while other requirements include consistency, flash point, cloud point, viscosity and corrosiveness. Provision has also been made for compatibility of the dispersant with other dispersants. (South Africa) (In Afrikaans and English)
W77-01387

A SANITARY ENGINEER'S VIEWPOINT ON THE DESIGN, INSTALLATION, MAINTENANCE AND COST OF SANITARY DRAINAGE SYSTEMS IN HIGH-RISE BUILDINGS,
For primary bibliographic entry see Field 8A.
W77-01388

KERBS AND CHANNELS,
National Physical Research Lab. Pretoria (South Africa).
For primary bibliographic entry see Field 8F.
W77-01389

FERTI-IRRIGATION - APPLICATION OF FERTILISER MATERIALS BY MEANS OF MICRO-IRRIGATION SYSTEMS - PART 1,
Stellenbosch Univ. (South Africa). Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W77-01393

FERTI-IRRIGATION-APPLICATION OF FERTILISER MATERIALS BY MEANS OF MICRO-IRRIGATION SYSTEMS - PART 2,
Stellenbosch Univ. (South Africa). Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W77-01394

LEAF ANALYSIS PROVES USEFUL IN INCREASING EFFICIENCY OF NITROGEN FERTILIZATION OF ORANGES AND REDUCING NITRATE POLLUTION POTENTIAL,
California Univ., Riverside. Dept. of Plant Sciences.
T. W. Embleton, W. W. Jones, and R. L. Branson.
Commun Soil Sci Plant Anal. 5(5), p 437-442, 1974.

Descriptors: *Nitrogen, Oranges, *Water pollution control, *Analytical techniques, *Leaves, *Fertilizers, *Pollutant identification.

In some areas in California N usage is now less than half of what it was prior to 1960. The reduction was associated with increased commercial usage of leaf analysis as a guide to N fertilization. Since 1960, as a result of the decrease in fertilizer applied, the annual per-acre amounts of fertilizer N that were subject to leaching in the Santa Ana Watershed were reduced by an estimated 50% in Riverside County and about 80% in San Bernardino County.--Copyright 1975, Biological Abstracts, Inc.
W77-01434

WATER RECLAMATION - QUALITY TARGETS AND ECONOMIC CONSIDERATIONS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W77-01440

SOIL-WATER-PLANT RELATIONSHIPS - IMPORTANT DESIGN CRITERIA FOR IRRIGA-

TION-PLANNING, (GROND-PLANT-WATER-VERHOUDINGS AS BELANGRIKE ONTWERP-GEGEWENS VIR BESPROEIING-SBEPLANNING),
Stellenbosch Univ. (South Africa). Dept. of Agriculture.
For primary bibliographic entry see Field 3C.
W77-01454

ENRICHMENT WILL MAKE US POORER, (VERRYKKING GAAN ONS ARMER MAAK),
National Inst. for Water Research, Pretoria, (South Africa).
D. F. Toerien.
Public Health, Vol. 76(3), p 87-93, (1975).

Descriptors: Eutrophication, Algae, Nutrients, Sedimentation, Nitrogen, Phosphorus, Oxygen, Oxygen demand, Fishkill, Sewage effluents, Industrial wastes.
Identifiers: South Africa, Vaal River, Hartebeespoort Dam, Rietvlei Dam, Roodeplaat Dam.

The problems of eutrophication in South African dams are discussed. Due to millions of litres of nutrient enriched effluents being released into rivers and streams eventually to be impounded in a number of large dams in and around the industrial heart of South Africa algae and water weeds flourish in these impoundments to the extent of making the water undesirable as raw water for drinking purposes or for recreational use. (South Africa)
W77-01456

A CASE FOR RECLAMATION,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W77-01458

POLLUTION, MAN, HIS ENVIRONMENT AND THE PHYSICIST, (BESOEDELING, DIE MENS, SY OMGEWING EN DIE FISIKUS),
A. Strasheim.
Geneeskunde, Vol 17(1), p 9-15, (1975). 4 fig, 4 tab, 32 ref.

Descriptors: Air pollution, Water pollution, Dispersion, Fluorescence, Carbon monoxide, Mercury, Lead, Sea water, Freshwater, Canada, United States, Absorption, Pollutant identification, Environment.
Identifiers: South Africa.

As environmental pollution is becoming a greater threat to man, knowledge of control mechanisms are becoming more important. The following points are discussed: (1) pollutants originating from motor vehicles; (2) spread of pollutants; (3) the determination of lead in blood by using the atomic fluorescence technique. (South Africa)
W77-01482

CONTROL OF WATER POLLUTION - A HIDDEN RESOURCE, (BEHEER OOR WATER-BESOEDELING - 'N VERBORGE HULPBRON),
Department of Water Affairs, Pretoria (South Africa).
R. T. Rudd.
The Civil Engineer in South Africa, Vol 17 (12), p 317-320, (1975).

Descriptors: Environmental effects, *Water pollution control, *Pollution abatement, *Natural resources, Recycling, Industrial wastes.
Identifiers: *South Africa, *Industrial wastes recovery.

Effective water pollution control embraces more than just supervision over the purification of polluted water. Pollution abatement in the fullest sense implies more efficient use of natural resources. The industries of South Africa are described as they occur in certain defined regions. Present methods of pollution abatement are discussed as well as trends toward the better utilization of raw materials which could result in higher production coupled with less pollution. Conversion of wastes to useful products and research work in this connection are mentioned. (South Africa)
W77-01489

THE EFFECT OF TWO COMMERCIAL HERBICIDES ON THE SETTLEMENT, GERMINATION AND GROWTH OF ENTEROMORPHA,
Newcastle-upon-Tyne Univ. (England). Dept. of Plant Biology.
For primary bibliographic entry see Field 5C.
W77-01503

RULES AND REGULATIONS: CONFINED FEEDING OPERATIONS.
Iowa Department of Environmental Quality, Water Quality Commission, 1971, 4 p.

Descriptors: *Regulation, *Iowa, *Waste water disposal, *Water pollution control, *Farm wastes, Feedlots, Water quality standards.
Identifiers: *Open feedlot, *Confinement feeding operation, Registration.

An open feedlot (unroofed or partially roofed adjacent or nearby animal enclosures on a single property) is defined in terms of specific animal populations and population densities. Confinement feeding operations (roofed or partially roofed adjacent or nearby animal enclosures on a single property from which wastes are removed as a liquid or semi-liquid) are defined in terms of maximum number of animals confined at one time. These data are given for beef cattle, dairy cattle, swine, sheep, turkeys, and chickens. Conditions requiring registration are outlined along with requirements for the facilities and for operation of the facilities. Feedlot pollution control facilities constructed in accordance with rules in effect at the time of construction shall not be required to be reconstructed due to subsequent rule changes unless the commission finds that waste discharge from such facilities is causing water pollution. Such facilities shall, however, be brought into compliance with rules in effect at the time of reconstructing, enlarging or otherwise modifying the confined feeding operations or control facilities. (Merryman-East Central)
W77-01512

SULFURIC ACID FOR THE TREATMENT OF AMMONIATED IRRIGATION WATER: I. REDUCING AMMONIA VOLATILIZATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
S. Miyamoto, J. Ryan, and J. L. Stroehlein.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 544-548, May-June 1975. 4 fig, 7 tab, 11 ref.

Descriptors: *Irrigated water, *Ammonia, *Ammonification, Water quality, Fertilizers, Fertilization, Acids, Waste disposal, Water pollution control, Waste water treatment.
Identifiers: *Sulfuric acid, *Ammonia volatilization reduction.

Effects of sulfuric acid applied to ammoniated irrigation waters on ammonia volatile losses are analyzed theoretically and evaluated by laboratory and field experiments. Volatile loss of ammonia from irrigation waters is directly related to the concentration of NH4OH. Sulfuric acid application reduces the concentration of NH4OH relative to the total N applied as anhydrous or aqua ammonia, principally by lowering pH. This consequently reduces ammonia volatile loss, e.g., by as much as 50% when acid is applied at rates equivalent to ammonia. The reduction of ammonia loss by sulfuric acid application through forming HNH4SO4- is nil. Simultaneous application
acid and ammonia may serve as a practical mea
of controlling ammonia loss as well as disposing
large quantities of projected surplus acid witho
reducing pH of irrigation water. (Skogerboe-Co
St)
W77-01517

PROSPECTS OF HYDROMETRY IN TH
LIGHT OF MODERN TECHNOLOGY,
International Commission on Irrigation a
Drainage, New Delhi (India).
For primary bibliographic entry see Field 7B.
W77-01519

PROCEEDINGS OF CONFERENCE ON FAR
ANIMAL WASTES: 'FARMER EXPERIENCE
CODES, GUIDELINES, RESEARC
PROGRESS, EQUIPMENT'.
Wisconsin Univ.-Madison. Cooperative Extensi
Programs.
Stevens Point, Wisconsin, February 9-10, 1972.
p. R. E. Graves, ed.

Descriptors: *Regulation, *Legal aspects, *Fa
wastes, *Equipment, Water pollution, Air pol
tion, Public health, Agricultural runoff, Confi
ment pens, Liquid wastes, Dairy industry, Wa
storage, Drying, Irrigation, Lagoons, Wiscon
Ducks.
Identifiers: *Waste management, Cost sharin
Land disposal.

This conference focused on the proposed Wisc
sin code on animal wastes existing and propos
manure handling guidelines, farmer experien
with various manure handling methods a
systems and equipment that industry has avai
today. Conference objectives were: (1) To g
farmers, industry and public agencies who h
pioneered new waste handling systems a chance
tell their story, (2) To review the contents
animal waste regulations proposed for Wiscon
and their implications, (3) To develop discussi
of present and future guidelines for handli
animal wastes, (4) To consider the adequacy
research, handling systems and equipment, c
rent programs for animal waste management, a
(5) To further discussion and communicati
among individuals, groups and agencies who h
an interest and concern in this area. (See W
01522 thru W77-01527) (Merryman-East Central
W77-01521

A REVIEW OF THE POLLUTION ABATEME
SITUATION IN INDUSTRY, MUNICIPALITI
AND GOVERNMENT,
Environmental Protection Agency, Washingt
D. C. Office of Solid Waste Management P
grams.
T. W. Bendixen.
In: Proceedings of Farm Animal Waste C
ference 'Farmer Experiences, Codes, Guidelin
Research Progress, Equipment', Stevens Poi
Wisconsin, February 9-10, 1972, p. 5-9.

Descriptors: *Water pollution, *Air pollutio
*Regulation, Liquid wastes, Solid wastes.

Mr. Bendixen reviews activities and programs
the Federal government related to pollution abe
ment. Among regulations reviewed are: (1)
Clean Air Amendment of 1970, (2) the Refuse A
of 1899, and (3) the Federal Water Pollution C
trol Act. Geographical coverage, variation in lo
conditions, varying assimilative capacities
water bodies and nature and interaction of poll
tants complicate any attempt to accurately ra
sources as to severity or to show trends of wa
pollution. However, using biochemical oxygen
mand as the criterion, many people feel that ind
trial wastes are the largest source of organic wa
pollutants nationwide; then municipal wastes; th
agricultural wastes. Environmental improvem
is a task of all the people, and every segment

ty, whether it be cities, towns, industry, ulture, business or governmental activities. also W77-01521) (Merryman-East Central) 01522

EVIEW OF ANIMAL WASTE REGULA-S AROUND THE NATION,
Last.
Proceedings of Farm Animal Waste Con-ce 'Farmer Experiences, Codes, Guidelines, arch Progress, Equipment', Stevens Point, onsin, February 9-10, 1972, p. 10-15.

riptors: *Water pollution, *Regulation, n, Pollution abatement, *Farm wastes.

ern agriculture contributes a variety of quali-grading substances to our waterways. In par-r livestock operations have been singled out ing a threat to water quality. It may be noted regardless of whether a state has a specific overning animal waste storage, transport, or sal, all states, since the passage of the Water ty Act in 1965, are required by federal law to approved water quality standards. Such stan-list minimum acceptable BOD levels, bac-counts, etc. for each water body. These stan-can be used to bring about a cease and desist against a livestock owner or operator. A er of states have gone one step further and ed animal waste pollution legislation. Ap-mately 14 states have present or proposed dealing with feedlot construction and/or tion. Eighteen states and several provinces nada have or are proposing specific animal regulations. An inventory of the states hav-pecific animal waste control regulations ls a great deal of difference in the content of egulations. Many of the animal waste codes in in or outside the body of rules, some state-of purpose, intent, or objective. Nearly code has a definitions section. Most of the contain information on water pollution abate-facilities. They establish a procedure for mining the need for such facilities, their n requirements, operation and upkeep. ner common feature of animal waste regula-s some form of permit system. The enforce-of the regulations may be handled either gh a state natural resources commission or a health agency. (See also W77-01521) yman-East Central) 01523

LUTION ABATEMENT IN WISCONSIN, ORICAL DEVELOPMENT AND PRESENT TUS,
onsin Div. of Environmental Protection, ns Point.
Williams.
roceedings of Farm Animal Waste Con-ce 'Farmer Experiences, Codes, Guidelines, rch Progress, Equipment', Stevens Point, onsin, February 9-10, 1972, p. 16-20.

iptors: *Regulation, *Air pollution, *Water ion control, *Wisconsin, *Pollution abate-

ion problems and attempts at pollution ment from colonial days to the present are ssed, citing specific pollution problems and tions. This is background for speeches to later which deal with the proposed Animal Rules. (See also W77-01521) (Merryman-Central) 01524

AL WASTE PROBLEMS NOW FACING DEPARTMENT OF NATURAL URCES,
onsin Dept. of Natural Resources, Madison. trial Waste Water Section.
Didier.

In: Proceedings of Farm Animal Waste Conference 'Farmer Experiences, Codes, Guidelines, Research Progress, Equipment', Stevens Point, Wisconsin, February 9-10, 1972, p. 21-28. 3 fig.

Descriptors: *Regulation, *Water pollution, *Wisconsin, Waste storage, Waste disposal, Agricultural runoff, *Farm wastes.

The Wisconsin Department of Natural Resources' statutory authority and responsibilities in relation to water pollution and more specifically as related to animal wastes are reviewed. Various types of agricultural pollution are pinpointed. Manure management problems include: manure storage and disposal, the need for manure management alternatives, feedlot runoff, and livestock destroying banks of unfenced streams. Regulatory, advisory and cost sharing agencies must be coordinated to solve these problems. Any solution to the animal waste management problem will involve a mix of programs, combining regulation, research, education, financial assistance, voluntary actions by the farmer himself and even tolerance on the part of the non-farming population. (See also W77-01521) (Merryman-East Central)
W77-01525

PROPOSED ANIMAL WASTE REGULATIONS FOR WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soil Science.
M. Beatty.
In: Proceedings of Farm Animal Waste Conference 'Farmer Experiences, Codes, Guidelines, Research Progress, Equipment', Stevens Point, Wisconsin, February 9-10, 1972, p. 32-36.

Descriptors: *Regulation, *Agricultural runoff, *Waste storage, *Wisconsin, Water pollution control, Water pollution sources, *Farm wastes.
Identifiers: *Waste management, Land spreading.

Background is given on how the ad hoc committee on agricultural waste pollution operated and how the animal waste rules were developed. Some of the major provisions of the rules are discussed. The rules begin with definitions of terms. The rules focus on water pollution. They give standards for systems of manure storage and handling. Plans for storage ponds and retention ponds must be reviewed by the Department of Natural Resources. The rules require plans for large operations, those that are greater than 800 animal units, to be submitted to the Department of Natural Resources for review. If manure is spread in the winter and no erosion control program is used, the spreading must be back a minimum of 200 feet from streams, lakes, ditches and ponds. The rules concentrate on point sources. Streams, lakes and ponds must be fenced out of the barnyards by 1975; and the runoff from animal lots and enclosures must be controlled so that the manure won't simply go under the fence and into a stream. A feedlot operator must have a minimum land area under his control for spreading of manure. One-third of an acre per animal unit for dairy, beef, swine, and sheep, and half an acre per animal unit for birds are the minimum areas suggested. The problem of odors is not dealt with due to their subjective nature. (See also W77-01521) (Merryman-East Central)
W77-01526

DEPARTMENT OF NATURAL RESOURCES PROPOSED ANIMAL WASTE MANAGEMENT RULES.
Wisconsin Dept. of Natural Resources, Madison.
In: Proceedings of Farm Animal Waste Conference 'Farmer Experiences, Codes, Guidelines, Research Progress, Equipment', Stevens Point, Wisconsin, February 9-10, 1972, p. 40-44.

Descriptors: *Regulation, *Waste storage, *Waste disposal, *Waste treatment, *Agricultural runoff, *Wisconsin, Water pollution, *Farm wastes.
Identifiers: Inspection.

The Proposed Animal Waste Management Rules are given. The preamble states that when wastes from agricultural activities impair water quality, systematic prevention or remedial action is required. The proposed rules establish standards and define procedures whereby the state can protect the public interest in maintaining the quality of water in Wisconsin. The recycling of animal wastes to the land and the continued development of new and innovative systems are encouraged. Coordination of the efforts of regulatory, educational, technical, and financial assistance program of other governmental agencies is also encouraged. Further technical development is necessary before rules controlling odors can be formulated. The Department of Natural Resources will continue to handle odor complaints individually and will promote further study of the problem. The rules will be periodically reviewed and, when necessary, revised to reflect advancing technologies of agricultural production and environmental protection. Outlined in the proposed rules are: (1) Definition, (2) Collection, storage and disposal of animal wastes, (3) Treatment of animal wastes, (4) Runoff control (animal shelters, enclosures and lots), (5) Filing of reports, plans and specifications, (6) Violations and enforcement, (7) Hearings, orders and appeals, (8) Inspection, (9) Limitations, (10) Severability, and (11) Applicability and effective date. (See also W77-01521) (Merryman-East Central)
W77-01527

MANURE DISPOSAL, POLLUTION CONTROL, AND THE NEW YORK DAIRY FARMER,
Cornell Univ., Ithaca, N. Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W77-01528

IMPLICATIONS OF EPA PROPOSED REGULATIONS OF NOVEMBER 20, 1975 FOR THE ANIMAL FEEDING INDUSTRIES,
Department of Agriculture, Washington, D. C. Animal Waste Subcommittee.
January 30, 1976, 39 p. 21 tab.

Descriptors: *Regulations, *Economics, *Water pollution sources, *Feed lots, Livestock, *Farm wastes.
Identifiers: *National Pollutant Discharge Elimination System, Waste management.

The Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) proposed regulations of November 20, 1975, for livestock operations could require an estimated 94,500 operations to apply for permits. The information contained in this report is based on expert opinion (not surveys) of USDA and State research and extension personnel located in major livestock producing States and was not available when EPA proposed the regulations. Of the estimated 94,500 operations affected by NPDES regulations--man-made waste conveyance, navigable water traversing the operation, and large operations--there are 14,000 beef, 32,000 dairy and 48,500 swine operations. In addition an estimated 250 turkey range operations would be affected. Estimates indicate that less than 4 percent of the operations that would be affected have capacities of more than 300 animal unit equivalents (300 beef animals, 750 swine and 210 dairy cows). Over 70 percent of the operations judged to be affected had capacities of less than 100 beef animals, 250 swine and 70 dairy cows. In order to comply with the proposed regulations, it is likely that affected operations would have to install systems to control discharges. Additional investments to install these systems would amount to about $205 million. For an additional 10 percent of the operations, the least-cost method of meeting proposed regulations would be to relocate the operation. The estimated 94,500 operations affected account for 20 percent of total fed beef marketings, 19 percent of milk sales, and 11 percent of hogs and pigs marketed. The proposed regulations contain a further provi-

sion for identifying a 'concentrated animal feeding'. This provision allows for 'case-by-case' designation of additional operations, regardless of size, that must apply for an NPDES permit, but the factors determining the outcome of these determinations are not listed in the proposed regulations. (Merryman-East Central)
W77-01529

LIVESTOCK AND POULTRY WASTE DISPOSAL CONTROL,
North Carolina Agricultural Extension Service, Raleigh.
G. Kriz.
Circular 556, February, 1973, 8 p.

Descriptors: *Air pollution, *Water pollution, *North Carolina, *Regulation, Waste disposal, Waste treatment, Feed lots, *Farm wastes.
Identifiers: *Waste management, *Land disposal.

Questions on air and water pollution control for livestock and poultry wastes are answered in this publication by the North Carolina Agricultural Extension Service. Areas of pollution control covered, include (1) Definitions of pollution and nuisance according to North Carolina Law, (2) Factors which determine how animal wastes become a nuisance or cause pollution, (3) Responsibilities of various state agencies, (4) Regulations--local, state or federal--that apply to animal waste disposal, (5) Services provided by the Board of Water and Air Resources, and (6) Assistance that is provided to animal producers by agencies, conservation services and agricultural departments in pollution control and prevention. Conditions affecting pollution potential of animal wastes, methods of animal waste management and land application rates are discussed. Final questions are answered that examine (1) where responsibility lies in insuring that pollution does not result from an animal operation, (2) methods for avoiding pollution when a production unit continues at the same level and (3) methods for avoiding pollution when a production unit either expands or builds a new facility. (Penrod-East Central)
W77-01538

THE EDITOR'S NOTEBOOK: ABOUT DISCHARGE REGULATIONS.
The Catfish Farmer, Vol. 6, No. 1, p. 7-8, January, 1974.

Descriptors: *Catfishes, *Runoff, *Permits, Regulation, Waste disposal.

Most catfish farming is exempted under new EPA regulations. Those facilities not subject to NPDES requirements are: (1) closed ponds with discharges only during annual harvesting or during periods of excess runoff, (2) facilities where discharges occur less than 30 days a year, and (3) facilities where flow is continuous but total number of pounds produced per year is less than 20,000 pounds. (Cameron-East Central)
W77-01541

ENVIRONMENTAL POISONS.
For primary bibliographic entry see Field 5C.
W77-01547

HOW NOW BROWN COW: REGULATION OF FEEDLOT POLLUTION IN WISCONSIN,
C. E. Blackwell, III.
Environmental Affairs, Vol. 3, No. 4, p. 769-789, 1974.

Descriptors: *Feed lots, *Pollution abatement, *Wisconsin, *Legal aspects, *Water pollution.
Identifiers: *1972 Federal Water Pollution Control Amendments, *National Pollutant Discharge Elimination System.

Water pollution due to feedlot runoff has become a serious problem. Several legal steps are reviewed in this article which are (or have been) directed toward pollution abatement. Of major importance among such legal steps is the 1972 Federal Water Pollution Control Amendments. Section 402 of the 1972 Act establishes the National Pollutant Discharge Elimination System which has been utilized to reduce point source water pollution by feedlots. The Environmental Protection Agency (EPA), which was granted authority to administer the permit program established by this Act, has attempted to abrogate the effectiveness of the Act. This may be due to any or all of the following: (a) To include greater numbers of small feedlots would place an unacceptable economic and manpower burden on the EPA, (b) EPA pollution control efforts have been focused on urban sources of water pollution, and (c) The EPA is sensitive to criticisms from Agribusiness. While the major concern has been that strict pollution controls would cause economic dislocation, some sources such as David Blitzer (National Resources Defense Council), maintain that such controls would foster reorganization of the industry into larger and more efficient production units. The threat to water quality by agricultural runoff pollution cannot be dealt with in the manner employed to date. The problem can only be solved through the cooperation of federal, state, and local governments which, unfettered by self-interested pressure groups or concerns over administrative burdens, have the resolve and energy to obtain a high standard of water quality. (Merryman-East Central)
W77-01549

MANAGEMENT AND CONTROL OF BEEF FEEDLOT WASTE,
O. E. Cross, and C. B. Gilbertson.
Farm, Ranch, and Home Quarterly, Nebraska Agricultural Experiment Station, Lincoln, p. 20-21, Winter, 1969. 2 fig.

Descriptors: *Feed lots, *Cattle, *Nebraska, *Regulation, *Agricultural runoff, *Water pollution, *Farm wastes.
Identifiers: Detention ponds, Rainfall.

Feedlot owners are being given the legal responsibility for insuring that their operation does not contaminate Nebraska's water. The Water Pollution Control Council of the Nebraska State Department of Health has been charged with setting up regulations to maintain Nebraska's water quality. Since information on the most effective ways to dispose of feedlot waste was not available, the Nebraska Livestock Feeders Association and its Pollution Control Committee were given two years to research and develop information on which regulations could be based. Several projects are underway to determine the efficiency of several different systems of waste management. Four systems are discussed which examine several aspects of feedlot waste management. These systems cover runoff collection and treatment, movement of solids on dirt lots, and various methods of loader cleaning. Rainfall, its duration and intensity is recorded for use in the analysis. (Penrod-East Central)
W77-01550

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A COARSE SORT SYSTEM FOR PRELIMINARY WATER RESOURCES MANAGEMENT ALTERNATIVES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
G. W. Reid, and N. Safarik.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 Price codes: A09 in paper copy, A01 in microf Completion Report, July 1976. 171 p, 2 fig, 1 66 ref, 4 append. OWRT A-054-OKLA(1). I 0001-6037.

Descriptors: Water resources, *Plan *Economics, Standards, *Alternative plan Management, Lakes, *Oklahoma, Model st Methodology, *Evaluation.
Identifiers: *Arcadia Lake(Okla), *Coarse System.

The present requirements for water reso planning include the development of at leas alternative plans, one emphasizing n economic development, the other, environm quality. The inclusion of the non-quantitativ vironmental objective necessitates the dev ment of models which can deal with both qua tive and qualitative data and which prov process for eliminating infeasible alternative effecting compromises between the two c tives. The Coarse Sort System is a non-mathe cal model which provides a method for evaluating both quantitative and nonquanti data and selecting a viable plan from among natives at the preliminary planning level. Coarse Sort System requires that after alter plans are developed, they be ranked accordi how close they come to meeting the goals project. After they are ranked, they are disp on sort charts, and the process of elimin (coarse sorting), trade-off and compromis lows. The sort charts provide a simple, method for communicating information abo various alternatives to the planners and public. The Arcadia Lake project in C Oklahoma is used to illustrate the process.
W77-01055

HISTORY AND DEVELOPMENT OF MU PLE OBJECTIVE PLANNING FOR WA RESOURCES,
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-01152

A SOLUTION PROCEDURE FOR THE DE PROBLEM OF A MULTIPLE TREATM PLANT SYSTEM ALONG A STREAM,
McGill Univ., Montreal (Quebec). Dept. of Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5D.
W77-01165

ESTIMATION OF RESPONSE SURF GRADIENTS IN MULTIOBJECTIVE WA RESOURCES PLANNING,
Waterloo Univ. (Ontario).
E. A. McBean, and J. C. Schaake, Jr.
Water Resources Research, Vol. 12, No. 4, p 598, August 1976. 8 fig, 15 ref.

Descriptors: *Water resources, *Plan *Estimating, *Markov processes, *Probal *Simulation analysis, Methodology, Riverb Reservoirs, Decision making, Comprehe planning, Alternative planning, Computer m Hydrology, Irrigation, Mathematical m Equations, Systems analysis.
Identifiers: *Multiple objective plan *Screening model, Gradient estimator, Ope rule.

A probabilistic Markov model of reservoir transitions is developed which, in combin with a simulation model, offers a computa tool for estimating response surface gradien water resources planning problems. Use o gradient estimation capability provides a sub tial improvement in efficiency of the searc improved water resources configurations. estimation capability arises by recognizing

ng the reservoir state transition changes that uld result from a modification of decision varia-s. The procedure is highly flexible in that it nctions under such complicated situations as ltiple-objective environments, nonlinear nefit loss functions, and complex connectivity river basin components. (Bell-Cornell)
7-01167

UIFER MANAGEMENT UNDER ANSIENT AND STEADY-STATE CONDI-ONS,
nford Univ., Calif. Dept. of Applied Earth ences.
r primary bibliographic entry see Field 4B.
7-01169

PREDATOR-PREY MODEL FOR DISCRETE-ME COMMERCIAL FISHERIES,
nsiglio Nazionale delle Ricerche, Milan (Italy). ntro di Teoria dei Sistemi.
Gatto, S. Rinaldi, and C. Walters.
plied Mathematical Modelling, Vol. 1, No. 2, p 76, September 1976. 12 fig, 12 ref, 2 append.

scriptors: *Fisheries, *Mathematical models, mulation analysis, Management, *Predation, h, Boats, Behavior, Estimating, Equations, stems analysis, *Commercial fishing.
ntifiers: Sensitivity, Productive equilibrium, rameter estimation.

very simple discrete-time predator (boats) - prey h) model for the description of the dynamic navior of a fishery is presented. The stability perties of the system are analyzed in some ail and the sensitivity of the equilibrium with pect to the catchability coefficient, the length the fishing season, and the investment coeffi-nt of the fleet is analyzed. Finally, a simple cedure is presented and utilized for estimating characteristic parameters of the fleet of a few neries. The agreement between the data and the dicted results is quite satisfactory when con-ering the crudeness of the model. (Bell-Cornell)
7-01171

OSYSTEM MODELS AND ENVIRONMEN-L POLICY,
n Diego State Univ., Calif. Center for Regional vironmental Studies.
r primary bibliographic entry see Field 6G.
7-01172

VELOPING OPTIMAL OPERATING RULES R FLOOD PROTECTION RESERVOIRS,
rlsruhe Univ. (West Germany). Institut fuer sserbau III.
r primary bibliographic entry see Field 4A.
7-01174

E MODELLING AND CONTROL OF POLLU-ON IN A RIVER SYSTEM,
nbridge Univ. (England). Dept. of Engineering.
r primary bibliographic entry see Field 5B.
7-01175

TER QUALITY CONTROL UNDER UNCER-INTY: OPTIMAL STOPPING RULES FOR MPLING,
zona Univ., Tucson. Dept. of Systems and In-trial Engineering.
r primary bibliographic entry see Field 5G.
7-01176

MPING POLICIES IN WATER SUPPLY,
ter Research Association, Marlow (England).
r primary bibliographic entry see Field 4A.
7-01177

THE SAINT JOHN RIVER SYSTEM MODELS: A CASE STUDY,
Department of the Environment, Ottawa (Ontario). Ecological Systems Research Div.
For primary bibliographic entry see Field 5G.
W77-01178

A COMPUTER-BASED TELECONTROL AND COMMUNICATION SYSTEM FOR A WATER SUPPLY NETWORK,
East Worcestershire Waterworks Co., Bromsgrove (England).
For primary bibliographic entry see Field 4A.
W77-01179

LINEAR MODELS FOR GROUNDWATER MANAGEMENT,
Water Planning for Israel Ltd., Tel-Aviv.
For primary bibliographic entry see Field 4B.
W77-01180

MULTIOBJECTIVE PLANNING: CONCEPTS AND METHODS,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 6B.
W77-01346

ENVIRONMENTAL DATA MANAGEMENT,
For primary bibliographic entry see Field 6G.
W77-01347

NONQUANTITATIVE METHODS IN WATER RESOURCES MANAGEMENT,
Louisville Univ., Ky. Systems Science Centre.
For primary bibliographic entry see Field 6B.
W77-01348

IDENTIFYING URBAN FLASH FLOODING PROBLEMS,
Washington Univ., St. Louis, Mo. Dept. of Technology and Human Affairs.
For primary bibliographic entry see Field 4A.
W77-01351

SYSTEM ANALYSIS: SPRINKLER SPACING, (SISTEEMANALISE: SPRINKELAAR-SPASIERING),
South Africa Dept. of Agricultural Technical Services, Pretoria.
For primary bibliographic entry see Field 3F.
W77-01453

'APPROACHES TO MULTI-OBJECTIVE PLANNING IN WATER RESOURCE PROJECTS,' BY BERNARD W. TAYLOR III, K. ROSCOE DAVIS, AND RONALD M. NORTH,
Cornell Univ., Ithaca, N. Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6B.
W77-01510

6B. Evaluation Process

RESEARCH TO DEVELOP ECOLOGICAL STANDARDS FOR WATER RESOURCES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6G.
W77-01054

A COARSE SORT SYSTEM FOR PRELIMINARY WATER RESOURCES MANAGEMENT ALTERNATIVES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6A.
W77-01055

FUTURE DIRECTION OF URBAN WATER MODELS,
Water Resources Engineers, Inc. Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W77-01071

CAUGHT IN MID-STREAM: ARMY CORPS OF ENGINEERS,
For primary bibliographic entry see Field 6E.
W77-01086

HISTORY AND DEVELOPMENT OF MULTIPLE OBJECTIVE PLANNING FOR WATER RESOURCES,
Water Resources Council, Washington, D.C.
G. D. Cobb.
In: Multiple Objective Planning for Water Resources, Volume 1, Proceedings of the UCOWR Workshop in Multiple Objective Planning and Decision-Making, Natural Resources Series Number 5, Idaho Research Foundation, Inc., Moscow, 1974. p 1-5.

Descriptors: *Water resources development, *Planning, *History, *Comprehensive planning, *River basin development, Regional development, Water quality, Decision making, *Water policy, Management, United States, *Legislation, *US Water Resources Council.
Identifiers: *Multiple-objective, Water quantity.

This article considers the role played by the Water Resources Council (WRC) and its Principles and Standards in the multi-objective planning and development of water resources. Two principal levels of planning are identified: National and regional or river basin, and characteristics of these levels are discussed. The history of water resources policy implementation from 1809 up to the National Environmental Policy Act of 1969 is traced. Finally, the WRC Principles and Standards are considered in detail, including their implementation and their influence upon the emergence of other natural resources policy considerations. (See also W76-11123) (Bell-Cornell)
W77-01152

THE ATTITUDE AND INTEREST OF THE ENVIRONMENTAL PROTECTION AGENCY IN MULTIPLE OBJECTIVE PLANNING OF WATER AND RELATED LAND RESOURCES,
Environmental Protection Agency, Washington, D.C. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W77-01153

EMERGING CORPS OF ENGINEERS GUIDELINES FOR IMPLEMENTING THE PLANNING REQUIREMENTS OF WRC'S PRINCIPLES AND STANDARDS AND RELATED POLICIES,
Corps of Engineers, Washington, D.C. Planning Div.
W. J. Donovan, and J. J. Jordan.
In: Multiple Objective Planning for Water Resources, Volume 1, Proceedings of the UCOWR Workshop in Multiple Objective Planning and Decision-Making, Natural Resources Series Number 5, Idaho Research Foundation, Inc., Moscow, p 9-19, 1974. 1 fig, 2 tab, 3 ref.

Descriptors: *Water resources development, *Planning, *Water policy, Methodology, Alternative planning, Environment, Quality control, Regional development, Evaluation, U.S. Water Resources Council.
Identifiers: *Multiple objective planning, Impact assessment, Social well-being.

The consideration herein is how to implement the multi-objective planning requirements of the Water Resources Council's Principles and Standards (P&S). The paper outlines the essential pol-

icy framework in which the U.S. Army Corps of Engineers proposes to implement P&S, highlights the limitations of P&S as a planning document, provides a limited, nondetailed exposition of a multi-objective planning process through plan selection and recommendation, and, finally, suggests some areas in which further research appears to be needed. The emphasis is methodological. Four functional planning tasks to be carried out during each of three stages of the planning process are identified and described: problem identification; formulation of alternatives; impact assessment; and evaluation. The impact categories, or objectives considered are national economic development, environmental quality, social well-being, and regional development. It is concluded that while there remain differences of view in high places regarding the appropriate number and content of the national objectives, acceptance of the concept of multi-objective planning as official national policy represents a substantial advance over the earlier, singular approach of economic development, the traditional objective of benefit-cost analysis. (See also W76-11123) (Bell-Cornell)
W77-01154

IMPLEMENTATION OF MULTIPLE OBJECTIVE PLANNING BY THE SOIL CONSERVATION SERVICE,
Soil Conservation Service, Washington, D.C. River Basin.
E. C. Buie.
In: Multiple Objective Planning for Water Resources, Volume 1, Proceedings of the UCOWR Workshop in Multiple Objective Planning and Decision-Making, Natural Resources Series Number 5, Idaho Research Foundation, Inc., Moscow, p 20-23, 1974.

Descriptors: *Planning, *Environment, *Water resources development, Water management(Applied), Regional development, Economics, Conservation, Alternative planning, U.S. Water Resources Council.
Identifiers: *Multiple objective planning, *Principles and Standards(Water Resources Council), Public participation, Environmental quality, National economic development.

The Soil Conservation Service (SCS) fully supports the concept of multiple objective planning. Since its inception in the mid-1930's, the SCS has followed this concept in all its programs. Within the last 20 years, as the programs of the SCS have become more water-management oriented, these same multiple objective concepts have guided the planning process. The SCS participated actively in the development and testing of the Water Resources Council's Principles and Standards. Discussed are limitations of the approved Principles and Standards and problems in implementation. Considered next are: The Optimum National Economic Development Plan (ONED); the Environmental Quality Plan; alternative plans; public participation; regional development; and additional needs wherein a wide range of environmental goals is needed. In conclusion the SCS fully supports the concept of multiple objective planning and has done this consistently throughout its agency life. Although it is encountering problems, several of these problems offer opportunities for research; answers or more rational procedures are essential to the effective and complete implementation of this process. (See also W76-11123) (Bell-Cornell)
W77-01155

PHILOSOPHY OF MULTIPLE OBJECTIVE PLANNING IN THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Washington, D.C.
D. L. Porter.
In: Multiple Objective Planning for Water Resources, Vol. 1, Proceedings of the UCOWR Workshop in Multiple Objective Planning and Decision-Making, Natural Resources Series Number 5, Idaho Research Foundation, Inc., Moscow, p 23-28, 1974.

Descriptors: *Water resources development, *Planning, *Research, History, Social aspects, Evaluation, Environment, Regional development, Cost allocation, U.S. Water Resources Council.
Identifiers: *Multiobjective planning, *Principles and Standards(Water Resources Council).

This article discusses problem areas of the Water Resources Council's Principles and Standards for multi-objective planning where research would be beneficial. The paper begins with a history review and then considers plan formulation, formulation to emphasize national economic development evaluation, environmental quality evaluation, regional development evaluation, evaluation of social factors, cost allocations, and the coordination and review of planning studies. It is concluded that new or improved procedures are needed in every area that demands the characteristics of multi-objectives, externalities, social values, etc. All effects, tangible and intangible, primary and secondary, on the multi-objectives need to be evaluated and considered in planning for water resources development. (See also W76-11123) (Bell-Cornell)
W77-01156

THE TENNESSEE VALLEY AUTHORITY AND MULTIPLE OBJECTIVE PLANNING,
Tennessee Valley Authority, Norris. Div. of Water Control Planning.
W. G. O'Neal.
In: Multiple Objective Planning for Water Resources, Vol. 1, Proceedings of the UCOWR Workshop in Multiple Objective Planning and Decision-Making, Natural Resources Series Number 5, Idaho Research Foundation, Inc., Moscow, p 31-34, 1974.

Descriptors: *Water resources development, *Planning, *Tennessee Valley Authority, History, Economics, Decision making, Water policy, Standards, Flood control, Costs, Benefits, Environment, U.S. Water Resources Council.
Identifiers: *Multiple objective planning.

Policies and procedures for water planning have long been the subject of controversy in this country. Economists continually disagree among themselves, and many competing interests constantly question each other's motives and actions. This disagreement over the numerous theoretical and methodological issues involved is symptomtic of the fact that the subject of controversy probably involves matters of real consequences. Moreover, some key issues need resolving which involve political and policy decisions, and the controversy is unlikely to have a simple and quick solution. This article questions whether application of the Water Resources Council's Principles and Standards for multiple objective planning can be expected to improve the public decision-making process in water resource planning. Discussed are selected items from the Tennessee Valley Authority's planning background which may be useful in understanding today's situation. Described are the TVA's experience in testing the new multiple objective planning approach and plans for applying it. (See also W76-11123) (Bell-Cornell)
W77-01157

THE DEPARTMENT OF TRANSPORTATION - USE OF MULTI-OBJECTIVE PLANNING,
Department of Transportation, Washington, D.C.
W. Riedal.
In: Multiple Objective Planning for Water Resources, Vol. 1, Proceedings of the UCOWR Workshop in Multiple Objective Planning and Decision-Making, Natural Resources Series Number 5, Idaho Research Foundation, Inc., Moscow, p 34-35, 1974.

Descriptors: *Water resources, *Planning, *Transportation, *Water policy, Legislation, U.S. Water Resources Council.
Identifiers: *Mulitople objective planning.

The Department of Transportation consists seven operating administrations, including the Lawrence Seaway Development Corporation, Federal Highway Administration, and the Un States Coast Guard. Despite its comprehensive ture, the Department of Transportation does have a major role in water resources multi-ob tive planning, since it is precluded from set criteria or standards for the formulation economic evaluation of all proposals wh federal funds are invested in transportation fa ties or equipment. However, in recent years, tain congressional acts have necessitated the partment's (DOT) increased involvement in w resources multi-objective planning (MOT). N doors have been opened concerning naviga projects. But DOT's role is still reactive. Critic is the role provided for the DOT by the W Resources Council's Principles and Standards order for the DOT to effectively implement M changes are required. (See also W76-11123) (B Cornell)
W77-01158

IMPLEMENTATION OF MULTI-OBJECT PLANNING IN THE DEPARTMENT OF CO MERCE,
Department of Commerce, Washington, D.C. fice of Policy Development and Coordination.
D. R. Baker.
In: Multiple Objective Planning for W Resources, Vol. 1, Proceedings of the UCO Workshop in Multiple Objective Planning Decision-Making, Natural Resources Se Number 5, Idaho Research Foundation, I Moscow, p 35-38, 1974.

Descriptors: *Water resources, *Plann *Administrative agencies, Economics, Envi ment, Transportation, U.S. Water Resou Council.
Identifiers: *Multiple objective planning.

The Department of Commerce initiates very water resources planning studies; Commer usual role as a participant in planning will cont with the Water Resources Council's new goa multiple objective planning. There is consider interest in the Department of Commerce in n imizing national economic development and vironmental quality control. The Department ticipates with other agencies as well in w resources planning. Since these efforts are widely known, and since the Department h relatively wide range of information and exper useful to planning studies, this article present explanation of Commerce's role in planning serve as a guide to those interested in implem ing the new multi-objective planning. Given partial summary of the missions for six of the partment's administrative units that effect or affected by water resources planning. Conside are the Departments operating units: (1) Dome and International Business/Bureau of Dome Commerce; (2) Maritime Administration; Economic Development Administration; (4) gional Action Planning Commissions; (5) So and Economic Statistical Administration/Bu of Economic Analysis; and (6) National Ocea and Atmospheric Administration. (See also W 11123) (Bell-Cornell)
W77-01159

CONCERNS OF THE U.S. FISH AND WILDL SERVICE IN MULTI-OBJECTIVE PLANNIN
Bureau of Sport Fisheries and Wildlife, Wash ton, D.C.
G. L. Hickman.
In: Multiple Objective Planning for W Resources, Vol. 1, Proceedings of the UCO Workshop in Multiple Objective Planning Decision-Making, Natural Resources Se Number 5, Idaho Research Foundation, I Moscow, p 41-44, 1974.

scriptors: *Fish, *Wildlife, *Planning, *Water ources, Land resources, Ecology, Environ-t, Research priorities, U.S. Water Resources ncil.
ntifiers: *Multiobjective planning, *Fish and dlife Service, Principles and Standards(Water ources Council), Environmental quality, lic participation, National economic develop-t.

e U. S. Fish and Wildlife Servicebelieves that e multi-objective plan formulation occurs as a rth major phase in the planning process under Principles and Standards. To place the Na-al Economic Development (NED) and En-nmental Quality (EQ) alternative futures in spective in a given planning area, to aid in scop- each alternative, and to avoid extraneous erials from creeping into the planning process , such as those associated with Regional velopment or Social Well-being), it is believed t the study area component need should be im-diately identified as to whether they are Na-al Economic or Environmental Quality in na-e. As a second step, a separate plan should be mulated for the EQ objective, and one for the D objective. Complementary features of the osing objective should be used in formulating h plans. Only after such plans have been for-lated and the effects of each plan evaluated inst the four accounts listed in the standards uld multi-objective plan formulation be started. cussed herein are responsibilities of the Fish l Wildlife Service, aspects of environmental lity planning, public participation and input, environmental quality objective, the ecological ource component, and research needs. (See o W76-11123) (Bell-Cornell)
7-01160

E USE OF MULTIPLE OBJECTIVE ANNING IN THE BUREAU OF LAND NAGEMENT,
reau of Land Management, Denver, Colo.
Fulcher.
Multiple Objective Planning for Water sources, Vol. 1, Proceedings of the UCOWR rkshop in Multiple Objective Planning and cision-Making, Natural Resources Series, mber 5, Idaho Research Foundation, Inc., scow, p 44-49, 1974.

scriptors: *Land management, *Planning, Stan-rds, Water resources, *Land use, Decision mak-, Economics, Evaluation, History, U.S. Water sources Council.
ntifiers: *Multiple objective planning, Public ticipation.

e Bureau of Land Management views multiple ective planning in a different perspective than ny other Federal agencies and institutions. It nsiders multiple use planning with its variety of ectives as synonomous with multiple objective nning; the Water Resources Council (WRC) nciples and Standards are merely evaluation cedures that can be applied to evaluating the ectiveness of its multiple use planning system. ly recently has the Bureau become seriously in-ved in trying to apply the WRC standards to luating its land management practices. It now ns to test the standards for evaluating its land nagement programs, and a team has been as-ned to test the procedures on specified activi-s in Oregon and New Mexico. It is anticipated t procedures will be developed from these tests Bureau-wide implementation of the WRC stan-rds in its planning system. This paper considers Bureau's involvement in multiple use (multiple ective) planning to date; the paper attempts to line the history of planning in the Bureau, cur-t status and components of the planning tem, and some deficiencies that have been ed. (See also W76-11123) (Bell-Cornell)
7-01161

PERSPECTIVE AND ROLE OF THE ECONOMIC RESEARCH SERVICE IN MULTIPLE OBJECTIVE PLANNING,
Department of Agriculture, Lincoln, Nebr.
N. E. Landgren.
In: Multiple Objective Planning for Water Resources, Vol. 1, Proceedings of the UCOWR Workshop in Multiple Objective Planning and Decision-Making, Natural Resources Series, Number 5, Idaho Research Foundation, Inc., Moscow, p 49-52, 1974.

Descriptors: *Economics, *Research, *Agriculture, *Natural resources, *Planning, Management, Conservation, Water resources, U.s. Water Resources Council.
Identifiers: *Multiple objective planning, *Economic Research Service (U.S. Dept. of Agriculture), Principles and Standards(Water Resources Council).

This presentation brings into focus some of the potential contributions of the Economic Research Service (ERS), U.S. Department of Agriculture, in multi-objective planning for the utilization, management, conservation and development of natural resources. This is accomplished by first describing the nature of Economic Research Service (ERS) participation in natural resources planning. This is followed by a brief discussion of the perspective of ERS as it relates to planning activities. Thirdly, some problem areas in which the Economic Research Service has both an interest and analytical capability are identified. (See also W76-11123) (Bell-Cornell)
W77-01162

ESTIMATION OF RESPONSE SURFACE GRADIENTS IN MULTIOBJECTIVE WATER RESOURCES PLANNING,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 6A.
W77-01167

EVALUATING ENVIRONMENTAL QUALITY MANAGEMENT PROGRAMMES IN WHICH DISCHARGERS ARE GROUPED,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-01170

LEGAL PROBLEMS ASSOCIATED WITH THE ROLE OF PLANNING IN WATER RESOURCES MANAGEMENT,
Melbourne Univ., Parkville (Australia). College of Law.
For primary bibliographic entry see Field 6E.
W77-01185

FLORIDA'S SYSTEM FOR REGULATION OF WATER USE--A MODERN INSTRUMENT FOR SOUND WATER RESOURCE MANAGEMENT,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-01186

THE COST-EFFECTIVENESS APPROACH IN ANALYZING A WATER SUPPLY PROJECT FOR THE SANTA ELENA PENINSULA, ECUADOR,
Arizona Univ., Tucson. Dept.of Hydrology and Water Resources.
J. C. Villao-Yepez.
Master of Science Thesis, 1975. 90 p, 12 fig., 14 tab, 26 ref, 2 append.

Descriptors: *Cost analysis, *Economic efficiency, *Water resources development, Project feasibility, Social aspects, Dynamic programming, Water quality standards, Water shortage.
Identifiers: *Cost-effectiveness analysis, *Santa Elena Peninsula(Ecuador).

A cost-effectiveness approach is presented for analysis of a water resource project in the Santa Elena peninsula of Ecuador, an area where lack of an appropriate water supply scheme has been detrimental to population health and living standard. The area and its specific water problems are discussed along with the methodology employed. The planning process begins by identification of goals which satisfy the social, economic and physical needs of the area. A relevance-tree technique was used to classify goals and relate them to system specifications. Points covered include the selection of fixed-effectiveness, merits of alternative systems analyzed in a tabular array, sensitivity analysis of each system in achieving measures of effectiveness and choice of the most appropriate alternative. Water quality analysis is done for each system, including bacteriological and physical-chemical water quality standards. The methodology is applied using the traditional approach and recent improvements in water resource planning for developing countries. (Jahns-Arizona)
W77-01270

GUIDELINES FOR LAKE WATERSHED MANAGEMENT PLANNING.
Maine Dept. of Environmental Protection, Augusta. Bureau of Water Quality Control.
For primary bibliographic entry see Field 5G.
W77-01291

COFFEE POND WATERSHED MANAGEMENT PLAN.
Maine Dept. of Environmental Protection, Augusta. Bureau of Water Quality Control.
For primary bibliographic entry see Field 5G.
W77-01292

FOREST LAKE WATERSHED MANAGEMENT PLAN.
Maine Dept. of Environmental Protection, Augusta. Bureau of Water Quality.
For primary bibliographic entry see Field 5G.
W77-01293

RESOURCE INVENTORY MANAGEMENT PLANNING SYSTEM (RIMPS). USER MANUAL,
Jordan (Edward C.), Inc., Portland, Maine.
For primary bibliographic entry see Field 5G.
W77-01294

FEDERAL MANPOWER IN WATER RESOURCE ENGINEERING,
Bureau of Reclamation, Denver Colo.
E. R. Lewandowski.
Journal of the Water Resources Planning and Management Division, Vol. 102, No. WR2, p 185-192, November 1976. 1 fig, 11 ref.

Descriptors: *Water resources development, *Engineering education, *Social impact, History, Federal government, Manpower, Personnel, *Engineering personnel.
Identifiers: *Developing countries, *Manpower utilization, Population(Statistics).

There are over 20,000 water resource engineers employed by all branches of the Federal government. Forecasts indicate more will be needed in the years ahead. Their tasks are constantly changing and they are being required to adapt to amplified responsibilities in connection with the search for new and varied sources of energy in which water plays a critical role. In addition, our engineers are being asked to adopt the role of educator in training and inspiring the engineers of developing nations in order that these countries may become self-sufficient in food and power production. The ways in which formal engineering education itself should modify the traditional approach and broaden the social and political consciousness of the developing engineer and aid the

practicing professional are covered. The future requirements for Federal manpower are explored. The varied disciplines necessary to solve new problems in desalting, wastewater treatment, and weather modification are summarized. (Bell-Cornell)
W77-01342

EDUCATION AND TRANING IN WATER RESOURCES PLANNING,
Polytechnic Inst. of New York, Brooklyn.
A. S. Goodman.
Journal of the Water Resources Planning and Management Division, Vol. 102, No. WR2, p 209-218, November, 1976. (Proceedings of the American Society of Civil Engineers) 1 fig, 9 ref.

Descriptors: *Water resources, *Water resources development, *Education, *Engineering education, Planning, civil engineering, *Training, Planning.
Identifiers: *Graduate study, *Water plans, Civil engineers, Continuing education.

Water resources planning may be defined to include the identification and evaluation of water resources, and the planning of projects that utilize and control water. In addition to having a background in engineering subjects and physical and biological sciences related to water, the practitioner in this field should ideally be skilled or knowledgeable, or both, in economics and other social sciences, legal matters, and other aspects of planning. Basic skills that should be developed in an undergraduate program are reviewed. Informal and formal education and training following the first degree, and one graduate course in water resources are described in some detail. (Bell-Cornell)
W77-01344

MULTIOBJECTIVE PLANNING: CONCEPTS AND METHODS,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
A. B. Bishop, M. McKee, T. W. Morgan, and R. Narayanan.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 239-253, November 1976. 4 fig, 3 tab, 43 ref.

Descriptors: *Water resources development, *Decision making, *Social values, *Planning, Methodology, Model studies, Systems analysis, *Multiple-purpose projects.
Identifiers: *Multiple objective planning, Social welfare, Public opinion.

Present day water resources planning encompasses social, environmental, and economic objectives in developing and choosing among alternative plans. Recent efforts to operationalize multiobjective planning have engendered a variety of new techniques. Where the emphasis has been on methodological developments, this paper considers how developing methodologies relate to the water resources planning process. In terms of the basic problem of multiobjective analysis, the function of the planning process is seen as integrating technical information from the planning team and social value information from the publics to arrive at a socially preferred alternative. A model of this process is presented and some desired attributes of multiobjective methods to support the process are identified. Several classes of multiobjective methods are described and compared as to their implementation requirements and their characteristics relative to both technical and value aspects of the planning process. Discussed are: visual techniques; rating and ranking methods; matrix and linear scoring methods; tradeoff displays and analysis; multiobjective programming; goals evaluation techniques; and iterative methods. (Bell-Cornell)
W77-01346

NONQUANTITATIVE METHODS IN WATER RESOURCES MANAGEMENT,
Louisville Univ., Ky. Systems Science Centre.
R. K. Ragade, K. W. Hipel, and T. E. Unny.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 297-309, 4 fig, 4 tab, 11 ref.

Descriptors: *Water resources, *Management, *Aesthetics, Optimization, *Planning, Methodology, Decision making, Evaluation, Social needs, Equations, Systems analysis, Algorithms, Water demand, Recreation.
Identifiers: Quantitative analysis, *Nonquantitative methods, Aesthetic properties, International pollution conflict.

In water resources planning, problems often arise where consideration must be given to intangible variables. If 'quantitative' optimization techniques are used, assigning numeric values to the intagibles usually fails to account for them satisfactorily. Furthermore, quantifying such factors can be classed under 'unnatural' methods of analysis. This is particularly true in humanistic and societal decision making, where one has to make many kinds of ethical and value judgments. Quantitative optimization methods though precise, become difficult to justify unless supplemented by subjective and other criteria. This paper examines the aforesaid problems and surveys alternative methods of analysis based upon 'nonquantitative' (i.e., 'non-numeric' and 'quasi-numeric') considerations of the variables. These method include fuzzy set theory, metagame analysis, and pseudoboolean methods. In conclusion, recent developments in non-numeric methods show promise for handling system design problems where intangibles need to be systematically accounted for and evaluated. (Bell-Cornell)
W77-01348

WATER CONFLICTS IN WESTERN COAL DEVELOPMENT,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 3E.
W77-01349

'APPROACHES TO MULTI-OBJECTIVE PLANNING IN WATER RESOURCE PROJECTS,' BY BERNARD W. TAYLOR III, K. ROSCOE DAVIS, AND RONALD M. NORTH,
Cornell Univ., Ithaca, N. Y. Dept. of Environmental Engineering.
L. M. Falkson.
Water Resources Bulletin, Vol. 12, No. 5, p 1071-1077, October 1976. 1 fig, 15 ref.

Descriptors: *Water resources, *Project planning, *Economics, *Systems analysis, Linear programming, Optimization, Simulation analysis, Algorithms, Benefits, Costs, Measurement, Reservoirs, Storage, Mathematical models.
Identifiers: *Multi-objective planning, Penalty costs, Goal programming, Minimization, Benefit maximization, Water uses.

One of the approaches to multiple objective planning in water resource projects discussed by the authors in this paper is goal programming. The purpose of this note is to comment upon the similarity and differences between the goal programming framework and the short-run loss function-target output concepts which appear in much of the water resource literature on the application of mathematical programming and simulation to water resources project design and operation (Maass, et al., 1962; Hufschmidt, 1963; Hufschmidt and Fiering, 1966; and Loucks, 1969). Mathematically, the incorporation of piecewise linear loss functions into a water resource system model is equivalent to goal programming. However, the economic interpretation of the two approaches is quite different. From the standpoint of theoretical welfare economics, there are only t
basic objectives, economic efficiency, and equ
in the distribution of income. (See also W76-013
(Bell-Cornell)
W77-01510

6C. Cost Allocation, Cost Sharing Pricing/Repayment

AN EXPLORATORY STUDY OF POSSIB
ENERGY SAVINGS AS A RESULT OF WAT
CONSERVATION PRACTICES,
Oklahoma Univ., Norman. Bureau of Water
Environmental Resources Research.
For primary bibliographic entry see Field 3E.
W77-01052

THE IMPACT OF INCREASED ENER
COSTS ON WATER USE AND AGRICULTUR
OUTPUT IN NORTHWESTERN OKLAHOMA
Oklahoma State Univ., Stillwater. Dept.
Agricultural Economics.
For primary bibliographic entry see Field 3F.
W77-01056

A FEASIBILITY/DEVELOPMENT STUDY F
THE REMOVAL OF AMMONIA FR
WASTEWATER USING BIOLOGICAL
REGENERATED CLINOPTILOTITE,
Illinois Univ. at Urbana-Champaign. Dept. of C
Engineering.
For primary bibliographic entry see Field 5D.
W77-01057

PUMPING POLICIES IN WATER SUPPLY,
Water Research Association, Marlow (England
For primary bibliographic entry see Field 4A.
W77-01177

THE COST-EFFECTIVENESS APPROACH
ANALYZING A WATER SUPPLY PROJE
FOR THE SANTA ELENA PENINSU
ECUADOR,
Arizona Univ., Tucson. Dept.of Hydrology
Water Resources.
For primary bibliographic entry see Field 6B.
W77-01270

ENERGY FOR WATER,
Southern California Metropolitan Water Distr
Los Angeles.
For primary bibliographic entry see Field 6D.
W77-01273

ENERGY SOURCES FOR IRRIGATION PUM
IN NORTHWESTERN NEW SOUTH WALES,
University of New England, Armidale (Austral
Dept. of Geography.
For primary bibliographic entry see Field 3F.
W77-01274

CLEARING AN ALLIGATOR JUNI
WATERSHED WITH SAWS AND CHEMICA
A COST ANALYSIS,
Forest Service (USDA), Fort Collins, Colo. Ro
Mountain Forest and Range Experiment Statio
For primary bibliographic entry see Field 4D.
W77-01430

6D. Water Demand

THE INTERFACE BETWEEN PLANNING A
WATER LEGISLATION,
For primary bibliographic entry see Field 6E.
W77-01183

TER LAW AND NEW TECHNOLOGIES.
ed Nations, New York.
primary bibliographic entry see Field 6E.
-01184

RGY FOR WATER,
hern California Metropolitan Water District, Angeles.
Lauten.
rican Water Works Association, Journal, Vol. lo. 7, p. 353-356, July, 1976.

riptors: *Water supply, *California, ropolitan Water Dist. of So. Cal., *Costs, ter delivery, Colorado River Aqueduct, educts, Environmental effects, *Energy.

prospects for securing sufficient energy in r to provide adequate water to Southern ornia are discussed. The energy requirements vater delivery to the area from Northern ornia and from the Colorado River are evalu- These figures and related costs are compared costs for pumping groundwater and reclaim- vastewater. New energy sources and effects nvironment are also discussed. The author ludes that the rapidly increasing cost of some e energy needed for pumping has become a us problem and the public will have to be ared to face increased power costs within the few years. (Jamail-Arizona)
-01273

TER CONFLICTS IN WESTERN COAL ELOPMENT,
tana State Univ., Bozeman. Dept. of Civil En- ring and Engineering Mechanics.
primary bibliographic entry see Field 3E.
-01349

TER AVAILABLE FOR ENERGY--UPPER ORADO RIVER BASIN,
State Engineer's Office, Salt Lake City.
primary bibliographic entry see Field 3E.
-01350

EFFECTS OF PRESSURE ON DOMESTIC TER SUPPLY INCLUDING OBSERVATIONS THE EFFECT OF LIMITED GARDEN- TERING RESTRICTIONS DURING A IOD OF HIGH DEMAND,
nnesburg City Engineer's Dept. (South a).
primary bibliographic entry see Field 3D.
-01360

R ACROSS THE LIMPOPO.
primary bibliographic entry see Field 8A.
-01369

ORESTATION, CATCHMENT PROTEC- AND WATER SUPPLY DEMANDS,
ralian National Univ., Canberra. Dept. of stry.
rimary bibliographic entry see Field 4D.
-01371

ER AND WATER FOR SOUTH WEST CA,
West Africa Water and Electricity Corp. Ltd., Windhoek.
rimary bibliographic entry see Field 3E.
-01382

MUM UTILISATION OF WATER,
rtment of Agricultural Technical Services, nbosch (South Africa). Winter Rainfall Re-

rimary bibliographic entry see Field 3F.
-01383

MUNICIPAL WATERSHED MANAGEMENT SURVEY,
Forest Service (USDA), Frankl'in, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 4D.
W77-01422

ESCOM PIONEERS DRY COOLING,
For primary bibliographic entry see Field 3E.
W77-01467

THE COOLING WATER EQUATION,
W. Van Der Merwe, and G. C. Hill-Smith.
Construction in Southern Africa, Vol 20(5), p 99-111, 1975. 4 tab.

Descriptors: *Water requirements, *Thermal powerplants, Water resources development, *Water demands, Africa, *Electric power, Demand, Water yield, *Cooling tower.
Identifiers: Umpilusi River, Hlelo River, *Dry cooling, Komati River, Pongola River, Usutu River, Slang River, Olifants River, Assegaai River, Boekenhoutrand Dam, Rosentuin Dam, *South Africa, *Transvaal.

South Africa's phenomenal economic growth over the last few years has brought with it a steeply rising demand for power. To meet this demand, South Africa's Electricity Supply Commission (ESCOM) has embarked upon a vigorous expansion programme and several new thermal power stations are being built in the Eastern Transvaal. The commissioning of these new units, however, will greatly increase ESCOM's water supply requirements. This paper, presented at the recent Cape Town conference on 'Energy and its future in Southern Africa' analyses the problem and offers some solutions. Dry cooling is explained and reasons are presented why (at present, at least) ESCOM wishes to defer large-scale adoption of dry cooling for as long as possible. Water yield from possible dam sites in all the major rivers of the Eastern Transvaal and extreme Northern Natal are investigatd. (South Africa)
W77-01468

DAMMING THE CROCODILE.
Construction in Southern Africa, Vol 19(11), p 67, 71, 73, (1975). 3 fig, 1 tab.

Descriptors: Dam design, Water supply, Costs, Water utilization, *Pre-impoundment, Industrial water, Domestic water, Irrigation water, Earthfill dams, Water requirements, Water demand.
Identifiers: *South Africa, *Crocodile River, Roodekopjes Dam.

The Department of Water Affairs is planning to build a dam on the Crocodile River near Brits. The Roodekopjes Dam, as it will be called, will help considerably in meeting water requirements for mining and industrial development, domestic usage and agriculture in the area. The dam will comprise an earth embankment with a gated concrete spillway and will cost in the region of R5,580,000. Existing dams in the area include the Kliproos, Vaalkop and Bospoort dams and the Department of Water Affairs is planning to operate these and Roodekopjes as a single unit in order to give the maximum advantage from them. (South Africa)
W77-01472

QUENCHING SALDANHA'S THIRST.
For primary bibliographic entry see Field 3E.
W77-01473

6E. Water Law and Institutions

THE MERRI CREEK FLOOD, 15-16 MAY 1974; CITIES OF NORTHCOTE BRUNSWICK (AUSTRALIA),
Melbourne and Metropolitan Board of Works (Australia). Main Drainage Div.
For primary bibliographic entry see Field 2E.
W77-01069

STATE REGULATION OF COASTAL WATER AREA PRESERVES,
Miami Univ., Fla., School of Law.
C. Hatfield.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-75 11172, Price code: A04 in paper copy, A01 in microfiche. Report No. FY 75-3, December 1974, 58 p.

Descriptors: *Shore protection, *Estuaries, *Coastal marshes, *Conservation, *Preservation, Protection, Coasts, Jurisdiction, International law, Administrative agencies, Federal government, State governments, Governmental interrelations, Parks, State jurisdiction, Wetlands, Legislation, Fisheries, Research facilities, Regulation, Political aspects, International waters, *Florida, On-site investigation.
Identifiers: *Coastal zone management, *Coastal waters.

Current demographic projections estimate that 80% of the population will live within 50 miles of the United States coastline by the year 2000. Protection of the ecological systems in these areas is necessary and could be achieved through reservation of permanent preserves or sanctuaries. The author discusses legislation enacted for the protection of marine sanctuaries by Florida, Massachusetts, Hawaii and California. Estuarine sanctuaries for research purposes have been set aside in Maine, Illinois, Wisconsin, Indiana, Ohio, Minnesota, and Florida. Problems which may arise in the establishment of a state sanctuary include conflicts with international law because of the 3-mile limit; jurisdictional conflicts between state and federal government where federal and state sanctuaries are contiguous; conflicts between the state and various federal regulatory agencies; and the question of compensation for private owners within a sanctuary area. Specific recommendations are made for the establishment and management of marine and estuarian sanctuaries. (Capehart-Florida)
W77-01072

BETTER THAN BEST: A CROSSCURRENT IN THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Cook Coll., New Brunswick, N.J.
For primary bibliographic entry see Field 5G.
W77-01073

THE 200-MILE EXCLUSIVE ECONOMIC ZONE: DEATH KNOLL FOR THE AMERICAN TUNA INDUSTRY,
F. Froman.
San Diego Law Review, Vol 13, p 707-741 (1976). 35 p, 1 fig, 4 map.

Descriptors: *Oceans, *Jurisdiction, *Fishing, *Law of the sea, *Fish migration, International law, Conferences, Treaties, Foreign waters, Political aspects, Legal aspects, Fisheries, Fish conservation, Marine fish, Boats, Unemployment, Economic impact, Federal government, Legislation, Coasts, Foreign countries.
Identifiers: *Coastal waters, *Tuna, Fishing industry, Licenses.

The concept of a 200-mile exclusive economic zone to protect coastal fisheries was discussed at the 1974 Law of the Sea Conference. The United

States is considering unilateral declaration of such an economic zone. Although the U.S. zone would exempt highly migratory fish species, the tuna industry asserts that this exception would go unnoticed by other countries who would then extend their own jurisdictions without the migratory exclusion. The effect of such a zone on the U.S. tuna industry would be disastrous. The tuna fishing techniques are shallow-water oriented with 80% of the Pacific tuna catch inside 200 miles of the Latin American coastal waters and 100% of the Atlantic catch within 200 miles of African waters. Destruction of the tuna fishing and processing industry would have significant national economic impact and a crippling economic effect in Southern California, Puerto Rico, and American Samoa. While concluding that world-wide cooperation through an international treaty would be the most effective solution, the author suggests use of force, negotiation or purchase of fishing rights, limited international agreement, and domestic legislation as alternative solutions to the problem. (Capehart-Florida)
W77-01074

RECENT DEVELOPMENTS IN THE LAW OF THE SEA: A SYNOPSIS,
R. G. Pickering, and W. W. Taylor.
San Diego Law Review, Vol 13, p 628-666 (1976), 38 p.

Descriptors: *Law of the sea, *Conservation, *Water pollution control, *Natural resources, *International law, Legal aspects, Conferences, Pollution, Ships, Jurisdiction, Manganese, Marine fisheries, Oil spills, Offshore platforms, Canals, Migration, Protection, Water pollution, Panama Canal, Research and development, Oceans, Ownership of beds, Continental shelf.
Identifiers: *Ocean dumping, *Ocean resources, *Thermal energy, Suez Canal, Tuna, Economic zones.

The second substantive session of the Third United Nations Law of the Sea Conference was held in Geneva in 1975. The major concerns of the conference included the following: (1) the development of a system for managing the exploration and exploitation of deep seabed resources; (2) an extension of the territorial sea from 3 to 12 miles; (3) establishment of an exclusive economic zone of 200 miles; (4) the establishment of guidelines for scientific research; and (5) the protection of the marine environment. Othe recent law of the sea developments are summarized under specific headings. The conservation area deals mainly with fishing quotas. The fishing category includes jurisdictional agreements and disagreements as to economic zones. The discussion of pollution and pollution control is divided into international, federal, and state subcategories with the main emphases on oil spills and ocean dumping. The seabed resources area covers oil leasing, manganese nodule mining, and ocean thermal energy. The category of shipping includes the United Nations Draft Convention on Shipping, the United States Deepwater Port Act of 1974, and information on the Suez and Panama Canals. The final area of sovereignty includes federal sovereignty over the Atlantic Continental Shelf and over certain Alaskan submerged lands. (Capehart-Florida)
W77-01075

THE NATIONAL PERMIT PROGRAM: A POLLUTER'S BRIDGE OVER TROUBLED WATERS,
For primary bibliographic entry see Field 5G.
W77-01076

OFFSHORE BOUNDARIES: ENGINEERING AND ECONOMIC ASPECTS,
National Ocean Survey, Rockville, Md.
H. Orlin.
Ocean Development and International Law Journal, Vol 3, p 87-96 (1975). 10 p, 1 fig.

Descriptors: *International law, *Law of the sea, *Boundaries(Property), *Continental shelf, Continental slope, Submarine canyons, Sedimentation, Geomorphology, Marine geology, Oceans, Sound waves, Sounding, Data collections, Maps, Surveys.
Identifiers: *Coastal waters, *Contiguous zones.

Aside from political and economic considerations, the setting of national and economic offshore boundaries presents some very practical problems. Boundary setting invalues three aspects: delimitation, demarcation, and recovery. Delimitation is the agreement as to boundary definition. Demarcation actually establishes the location of the boundary and recovery refers to returning to or physically recognizing the boundary. Demarcation and recovery present certain technological difficulties with regard to the sea. If boundaries are established in terms of distance from baseline no major problems are involved once such baselines are established. Determination of boundaries in tems of depth, slope-rise intersection, or oceanic-continental crust intersection, however, require use of equipment for acoustical or echo measuring; and data in existence regarding ocean floors is not always accurate or complete. In addition, some demarcations are more clear than others in various areas of the world. All in all, international consideration of the problems involved beforehand can prevent years of future dispute. (Comer-Florida)
W77-01077

OWNERSHIP ON NAVIGABLE WATERBOTTOMS--CALIFORNIA COMPANY V PRICE REVISITED,
F. J. Crosby.
Louisiana Law Review, Vol 36, p 694-704 (Winter 1976), 11 p.

Descriptors: *History, *Louisiana, *Judicial decisions, *Ownership of beds, *Beds under water, Legal aspects, State governments, Beds, Boundaries(Property), Navigable rivers, Navigable waters, Streambeds, Riparian rights, High water mark, Low water mark.

Examined here is whether a state or private entity holds title to beds of navigable waterways. The question arose in Louisiana, where the Louisiana Supreme Court held in 1954 in California Co. v Price that private ownership of such beds is permissible under state law. The court re-examined the same question in 1975, however, and reversed itself in Gulf Oil Corp. v State Mineral Board. It was held that 'patents purporting to convey the beds of navigable waterways in Louisiana are ineffective'. A short history is given of the development of waterbottom ownership rights in America, as well as of the common law notion of implied sovereignty, which dates back to medieval England. (Frank-Florida)
W77-01078

MODEL WATER RESOURCES PROGRAM,
A. Morse.
Natural Resources Journal, Vol 12, p 388-412 (1972). 25 p, append.

Descriptors: *United States, *Canada, *Water resources development, *International joint commission, *Treaties, Legal aspects, Federal government, Rivers, North Dakota, International commissions, Recreation, Comprehensive planning, Regional development, Resources, Water utiliation, River flow, Irrigation, Economic feasibility, Floods, Optimum development plans.
Identifiers: *Pembina River Basin, *International Joint Commission on the Pembina River Basin.

The Pembina River is located 80 miles southwest of Winnipeg, Manitoba, and 160 miles north of Bismarck, North Dakota. It provides the boundry between the United States and Canada. This river has great economic potential for both countries, but at present poor river flow, heavy growths, recurrent seasonal flooding, and la recreation facilities require such potenti remain dormant. Both the United States Canada have determined that unilateral proje improve the river are not economically feasib cooperative project is the only way to releas river's vast potential. The Report of the Int tional Joint Commission on the Coope Development of the Pembina River Basin cluded that such a combined effort woul economically rewarding to both countrie counter the problem of which country would trol the completed facilities, an international commission composed of three members each country is proposed. The commission maintain the facilities and determine wha should be made of them. Legal problems a out of the facilities would be tried in the cou the country where they arise. Both cour courts would be freely open to citizens of the country. (Moorhouse-Florida)
W77-01079

DRIP IRRIGATION: ISRAEL TEA CALIFORNIA,
For primary bibliographic entry see Field 3F.
W77-01080

ENERGY AND THE COASTAL Z PULLING AND HAULING AMONG THE F
L. J. Carter.
The Nation, Vol 220, p 1285-86, 1288, Jun 1975. 3 p.

Descriptors: *Federal government, *Coast gineering, *Planning, *Federal jurisdiction, jurisdiction, Maine, Washington, Environm control, Environmental engineering, Shore p tion, Shores, Coasts.
Identifiers: *Coastal zone management, *C Zone Management Act.

In 1972 Congress passed the Coastal Management Act (CZMA) to encourage sta reconcile conflicts over land and resourc along the coastal margins. The intent was th federal government would evaluate onl adequacy of state coastal management proc and would not dictate the degree of c development the states should allow. This h turned out to be the case, however. The F Energy Administration (FEA) and the E Research and Development Administratio well as the Federal Power Commission, ar rently taking exception to the first two coastal zone programs submitted for inter-a review, namely those of Maine and Washi Their objection is that the states have an obli to include in their coastal management plans specific provisions for energy development, though specific plans for the nation's e resources have not themselves been devise Office of Coastal Zone Management (OCZM tends that the states are not obligated to des energy facility sites, even though their fail do so violates the spirit of the 1972 Act. in sh no compromise can be reached, the OCZ only two options: to disapprove plans only energy provisions are arbitarily left out com ly; or to approve inadequate energy plans ar the risk of incurring the energy agencies' (Frank-Florida)
W77-01081

BURNING WASTES AT SEA--IF THE EP PROVES,
For primary bibliographic entry see Field 5G.
W77-01082

OF SLIME AND THE RIVER,
For primary bibliographic entry see Field 5B.
W77-01084

UDGE,
r primary bibliographic entry see Field 5G.
77-01085

AUGHT IN MID-STREAM: ARMY CORPS OF GINEERS,
Slade.
e Nation, Vol 221, p 179-81, Sept 6, 1975. 3 p, 1 oto.

scriptors: *Environmental effects, *Cost-nefit analysis, *Dam construction, *Civil en-eering, *Canal construction, Floods, Flood charge, Flood protection, Flood routing, Bar-rs, Water storage, Water control, Federal vernment, Legal aspects, Environmental en-eering, Environmental control, Dams, Canals, st-benefit theory.
ntifiers: *Environmental impact statement, ational Environmental Policy Act, Administra-e regulations.

e Army Corps of Engineers has, in the past, ed economic cost-benefit justifications for many its projects. This method is coming into estion as economists and environmentalists ound the nation challenge what they contend are ccurate analyses by the Corps. These analyses ce went without scrutiny, but now the whole ocess of construction has been slowed by the ssage of the National Environmental Policy Act 1970 (NEPA). The Corps is required to file an vironmental impact statement (EIS) for each nstruction project, and hearings are now man-ted at every stage of the planning process. This s given environmentalists time to mobilize facts, ures, and the public against agressive water nstruction projects. Nevertheless, it is estionable whether an unfavorable EIS state-nt can effectively prevent projects where there no environmentally safe way to build. In addi-n, it is unlikely that EIS's will have any impact yond the particular project since different sec-ns of the country feel differently about the onomic and environmental aspects of construc-n. Thus, until Congress mandates otherwise, the st-benefit analysis will remain a prime factor in stifying Corps projects. (Frank-Florida)
77-01086

ORELAND REGULATION IN WISCONSIN,
sconsin Dept. of Natural Resources, Madison.
Lauf.
astal Zone Management Journal, Vol 2, No 1, p 58 (1975). 12 p, 1 fig, 8 ref.

scriptors: *Comprehensive planning, *Share otection, *State governments, *Wisconsin, Per-ts, Water resources, Legal aspects, Zoning, cal governments, Regulation, Shores, Short-m planning, Long-term planning, Lakes, Ponds, eams, Floodplains.
ntifiers: *Water Resources Act of 1966, dministrative regulations.

sconsin's enormous lakefront land area has en used since the 1900's for recreation and for ch unplanned development. In order to curb the ulting environmental damage as well as provide local control of local property, the legislature ssed the Water Resources Act of 1966. The bill ables counties to zone all unincorporated areas ng 1000 feet landward of lakes, ponds, and wages, and to zone 300 feet landward of eams, or the landward side of the floodplain, ichever is greater. In addition, the state also veloped standards and criteria for sanitary trictions and subdivision regulations. These wers have, for the first time, given localities ntrol of those areas closest to them. Developers ght the bill and challenged it in court after its ssage. However, the Supreme Court in Just v. rinette County affirmed the concept of specific oreland regulation and special permit hniques. Thus, local governments now have the wer whether they will use it wisely in formulating rational, planned decisions remains to be seen. (Frank-Florida)
W77-01087

PUBLIC RIGHTS TO ARTIFICIAL WATER-BODIES IN FLORIDA,
Florida Univ., Gainesville. School of Law.
M. Nelson.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $1.30. (1976), 25 p.

Descriptors: *Public rights, *Florida, *Artificial lakes, *Artificial watercourses, Impoundments, Riparian rights, Land tenure, Navigable waters, Non-navigable waters, Prescriptive rights, Easements, Canals, Recreation, Judicial decisions, Legal aspects, Public access, Navigation, Recreation demands, Social aspects, Reservoirs.
Identifiers: *Public trust doctrine, Navigability tests.

Under Florida law, public rights attach to navigable waters. The increasing need for state control of artificially created bodies of water for recreational and environmental purposes raises the question of whether public rights may be attached to artificial waters. When navigable waters are artificially enlarged or improved, the right of navigation is not limited to the original channels. Public rights, however, do not attach to non-navigable waters made navigable by private landowners. Riparian rights also do not attach to artificial bodies of water but they may be attached through claims of easements, permissive use, dedication, or reservation in deed. Public rights may also be asserted by use of the same doctrines as well as through a claim of recreational navigability. Although not yet accepted in Florida, the recreational use test of navigability may evolve into a means to assert a public claim to artificial waters. The author concludes that increasing public claims on artificial waters may lead to a change in the common law approach. (Capehart-Florida)
W77-01088

UNITED STATES STEEL CORPORATION V SAVE SAND KEY, INC.: A LOSING BATTLE IN THE FIGHT FOR FLORIDA BEACHES,
Florida Univ., Gainesville. School of Law.
T. Mariani.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.20. (1976), 28 p.

Descriptors: *Common law, *Florida, *Beaches, *Public access, *Public rights, Land tenure, Population, Legal review, Islands, Coastal structures, Recreation, Prescriptive rights, Judicial decisions, Legislation, Right-of-way, Protection, Social aspects, Oregon, California.
Identifiers: *Standing(Legal), *Nuisance(Legal aspects), Injunctive relief, Prescriptive easements.

Only 277 of the 6,265 miles of Florida beaches are publicly owned. The rapidly expanding population of the state gives rise to a need for the preservation of public beaches and for the establishment of public rights in private beaches. Through use of the unsuccessful litigation by Save Sand Key, Inc., a citizen's group, the author examines the legal theories employed by plaintiffs to establish public rights. The claim of public acquisition of a prescriptive easement is one that is severely restricted by Florida's conservative courts and is seldom successful. Implied dedication of public rights, successfully used in California, is another doctrine which has problems in Florida because of the requirement of proving the intention to dedicate. The English doctrine of custom, used in Oregon to preserve large areas of beach has been accepted by Florida courts. This doctrine, however, was never applied to the Save Sand Key case since the suit failed under a nuisance theory for lack of standing. The author decries the failure of the government to protect Sand Key and concludes that legislation permitting public interest suits for beach protection is necessary. (Capehart-Florida)
W77-01089

THE DEVELOPMENT AND IMPLEMENTATION OF THE COASTAL CONSTRUCTION SETBACK LINE LAW,
Florida Univ., Gainesville. School of Law.
W. M. Sensabaugh.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $2.25. (1973), 45 p, append.

Descriptors: *Construction, *Coasts, *Florida, *Beach erosion, *Beaches, Oceans, State governments, Environmental effects, Environmental control, Environment, Erosion, Shore erosion, Dunes, Sands, Seashores, Legislation, Legal aspects, Administrative agencies.

In Florida there has been little corporate concern with the problems of beach-front development. In response to a growing interest in beachfront protection, Florida passed the Coastal Construction Setback Line Law. This legislation makes it unlawful to excavate, or to construct any structures within 50 feet of the mean higher water line (MHWL) without first obtaining a permit from the State Department of Natural Resources. This 50 foot limit is hard to administer and enforce, however, because it is difficult to determine accurately the MHWL. Also, the measurement must be taken on the day the owner begins construction, because the owner may in good faith have miscalculated, and a later measurement could put him in violation of the law. Finally, topographic and engineering studies will be required for much of Florida's coasts. Beach changes must also be taken into account. (Frank-Florida)
W77-01090

SOME WATER LAW PROBLEMS ASSOCIATED WITH ESTERO BAY, FLORIDA,
Florida Univ., Gainesville. School of Law.
W. H. Harrell.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $1.75. (1974), 35 p.

Descriptors: *Florida, *High water mark, *Tidal marshes, *Mangrove swamps, *Grasses, *Boundaries(Property), Shallow water, Salt marshes, Berms, Geomorphology, Water level fluctuations, Seashores, Banks, Ownership of beds, Aquatic plants, Soil-water-plant relationships, Water requirements, Amphibious plants, Aquatic weeds.
Identifiers: Coastal waters, Coastal zone management, Presumptions(Legal), *Estero Bay(Fla).

Stretches of Florida's coastlines, such as the Estero Bay area, present special problems in relation to private and public property determinations. Estero Bay is a protected area not subject to normal wave action and thus has no berms except those caused by storm. The coastal areas of the bay, however, are thick with vegetation making measurement of the mean high water mark difficult and expensive. The prevailing law of state property determination is that if the mean high water mark cannot be determined the federal meander line can be used. The law may have unfortunate results, because often the meander line bears no resemblance at all to the mean high water mark. Estero Bay, like all other vegetated coastal areas, presents its own set of indicators of boundary. The vegetation can be divided into that growing above and that growing below the high water mark. Vegetation will not pinpoint the precise boundary but it can still be used to avoid grossly inaccurate determinations. (Comer-Florida)
W77-01091

LEGAL CONSIDERATIONS CONCERNING OYSTER CULTIVATION IN FLORIDA,
Florida Univ., Gainesville, School of Law.
R. H. Rex.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $2.75. (1976), 55 p.

Descriptors: *Florida, *Oysters, *Shellfish farming, *Leases, Legislation, State jurisdiction, Federal jurisdiction, Rivers and Harbors Act, Submerged Lands Act, Administration, Regulation, Riparian rights, Permits, Water resources development, Aquiculture, Legal aspects, Water law, Commercial shellfish, Commercial fishing, Crustaceans, Invertebrates, Fishing gear, Fish harvest.
Identifiers: Coastal waters, Coastal zone management, Navigation obstructions, Water rights(Non-riparians), Licenses.

Oysters in the submerged lands of Florida belong to the state in public trust by virtue of the federal Submerged Lands Act. Control of submerged bottom lands and their associated resources is vested in the Division of Marine Resources of the Department of Natural Resources. The law of Florida allows leasing of such resources in accordance with statutory requirements. Two types of leases are available: the lessee may obtain rights only to the submerged bottom land, or he may obtain rights to the bottom and to the water column above. Both leases are limited to the extent of use necessary to accomplish the purpose of the lease. Besides compliance with Florida law and administrative regulations, a lessee must consider federal jurisdiction. In addition, boundary markers of all leased areas must comply with Coast Guard regulation. The Army Corps of Engineers may become involved if obstruction to navigable waters is contemplated. The Corps involvement is most likely in event of aquicultural leases, which include the water column above bottom. (Comer-Florida)
W77-01092

TIDAL BOUNDARIES IN FLORIDA,
Florida Univ., Gainesville.
J. L. Reinman.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $1.35. (1974), 27 p.

Descriptors: *Florida, *Ownership of beds, *High water mark, *Meanders, *Banks, *Boundaries(Property), Tidal waters, Water levels, Water level fluctuations, Tidal effects, Variability, Coastal marshes, Tidal marshes, Mangrove swamps, Freshwater marshes, Wetlands, Navigable waters, Riparian rights, Real property, Water law.
Identifiers: Coastal waters, Coastal zone management.

Florida law dictates that the boundary line between privately owned uplands and state owned submerged lands along navigable waterways is the 'ordinary high water mark'. A problem of definition results from use of this term, however, because earlier cases in Florida, as well as in other states, have defined the mark in terms of neap tide high water. The federal definition of 'ordinary high water', on the other hand, is determined as the mean high water of all tides, spring as well as neap. Current usage in Florida indicates an adoption of the federal definition, although no definitive statement to that effect has been presented by the courts. A further complication of the high water mark as boundary question is the occasional use of the federal meander line as a boundary. Technically the meander line boundary applies only to swamp and wetlands that are not navigable. The Florida courts, however, use the meander line when navigable waters are bordered by marsh so as to make the high water mark impossible to determine. (Comer-Florida)
W77-01093

FEDERAL REGULATION OF DEVELOPMENT IN FLOOD-PRONE WETLANDS--THE ARMY CORPS OF ENGINEERS,
Florida Univ., Gainesville. School of Law.
R. B. Heyward.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $0.90. (1975) 18 p.

Descriptors: *Land use, *Flood control, *Regulation, *Federal jurisdiction, *Flood plain insurance, Flood plain zoning, Legislation, Flood plains, Flood protection, State jurisdiction, Flood damage, Non-structural alternatives, Flow control, Floodway, Watershed management, Channel improvement, Administrative agencies, Federal government, Permits, Administrative decisions, Adoption of practices.

The Federal Flood Disaster Protection Act of 1973, together with the National Flood Insurance Act, provides flood protection through combining land use regulation and insurance. The federal program is not entirely effective, however, since 11,000 of the near 15,000 eligible communities had not qualified for insurance protection as of 1974. These flood-prone communities exemplify the need for alternative flood control measures. One alternative is the use of the Army Corps of Engineers as a regulating agency exercising jurisdiction in the area of flood control. The Corps was originally granted jurisdiction over channel and watershed drainage improvements under the Flood Control Act of 1944. The jurisdiction was enlarged to include land use planning under the Watershed Protection and Flood Prevention Act. To date the Corps has limitedly exercised jurisdiction, and no congressional mandate requires the Cors to act. In fact the federal insurance program seems to support the Corps' reluctance. Thus, if insurance is ineffective, other measures are required. (Comer-Florida)
W77-01094

A STUDY OF VARIOUS STATE FLOOD PLAIN REGULATIONS IN AN EFFORT TO EMPHASIZE FLORIDA'S NEED TO EXACT COMPREHENSIVE PLANNING AND LAND USE CONTROLS, WHICH ARE DESIGNED TO AFFORD PROTECTION AGAINST HURRICANE DAMAGE,
Florida Univ., Gainesville. School of Law.
R. Herold.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $1.35. (1974), 27 p.

Descriptors: *Florida, *Hurricanes, *Flood damage, *Southwest U.S., *Flood plain zoning, Arizona, Utah, Nevada, Texas, California, Hurricanes, Shore protection, Coastal structures, Land use, Building codes, Legislation, Regulation, Safety factors, Buildings, Standards, Permits, Legal aspects.

Florida has had, in the last 25 years, massive coastline development. As yet, none of the recent construction has been tested by a '100 year flood' or even by very severe hurricanes such as those of the 1920's and 1940's. The state must, to protect all of its inhabitants, formulate and implement a flood plain planning program to prevent excessive construction in flood prone areas and to protect the beach dune areas which provide protection from hurricanes. Nevada, Arizona and Utah, have recently enacted such flood plain planning programs aimed at increasing protection from and conservation of flood waters. The needs of these states, however, are very different from Florida's needs. California and Texas have implemented programs for protection of coastal communities. Texas' program is of special interest to Florida because Texas is also prone to hurricane damage. Unlike Florida, Texas has received recent severe flood damage. Florida should take heed and establish comparable protection before similar harm is done. (Comer-Florida)
W77-01095

USE OF BUILDING CODES: TO REGULA
FLORIDA'S HURRICANE FLOOD PLAIN,
Florida Univ., Gainesville. School of Law.
J. M. Hess.
Available from Eastern Water Law Cen
University of Florida, Gainesville, Florida 32
for $1.65. (1976), 33 p.

Descriptors: *Flood control, *Florida, *Fl
plain zoning, *Building codes, *Constitutio
law, Flexible foundations, Design standards, C
struction material, Flood damage, Legislati
Regulation, Safety factors, Permits, Land u
Buildings, Standards, Legal aspects.

One of the most controversial methods of fl
plain management is land use regulation. T
method is also the most effective managem
plan. Flood plain zoning which prevents consti
tion of all or of certain types of buildings runs
greatest risk of constitutional challenge. Flo
has yet to consider the issue but court reactio
prohibitive zoning in other states has been mi
Serveral such ordinances have been found to
unconstitutional takings. Another measure wh
is less open to the taking argument is use of bu
ing codes. If this measure is adopted the
really effective program would have to incl
codes requiring alteration of existing structure
well as construction regulations for new st
tures. Building codes are subject to equal pro
tion challenges. Furthermore, the finan
problems, particularly with regard to exis
structures, may be immense. Such difficulties
be overcome, however, and such program h
had good results where implemented. (Con
Florida)
W77-01096

DRAWING THE LINE AT THE OCEANFRO
THE ROLE OF COASTAL CONSTRUCTI
SET-BACK LINES IN REGULATI
DEVELOPMENT OF FLORIDA'S COAST
ZONE,
Florida Univ., Gainesville. School of Law.
A. J. O'Donnell.
Available from Eastern Water Law Cen
University of Florida, Gainesville, Florida 32
for $2.00. (1976). 40 p.

Descriptors: *Florida, *Shore protection, *Coa
structures, *Beach erosion, *Littoral d
*Accretion(Legal aspects), High water m
Flood control, Sea walls, Dune sands, Wind
sion, Dunes, Legislation, Building codes, Perm
Administrative decisions, Regulation, Plann
Constitutional law, Legal aspects, Land use.
Identifiers: Coastal zone management, Coa
waters.

To prevent danagerous and excessive occuren
of floods and beach erosion, the state of Flo
has established a system of set back li
Originally the interim line for all beaches was
at 50 feet from the mean high water mark, but
closer than allowed by local ordinances. Since
interim line was established the state has
dertaken studies of different beach areas and
set permanent set back lines for each beach
determined by local flooding and eros
problems. Local ordinances, if stricter, must
be complied with under state law. Variances fr
the set back requirements are possible but invo
potential conflicts with local and federal reg
tion. Thus, few variances are granted. Set b
legislation has not been a real problem in relat
to the taking issue that has plagued coastal zon
However, while set back laws provide suffici
flood and erosion coastal protection, coastal z
ing protects coastal vegetation as well. (Con
Florida)
W77-01097

URBAN STORM WATER RUNOFF: A TW
FOLD PROBLEM,
Florida Univ., Gainesville. School of Law.
D. Fernandez.

vailable from Eastern Water Law Center, niversity of Florida, Gainesville, Florida 32611, r $2.45. (1976), 49 p.

escriptors: *Storm runoff, *Cities, *Storm ains, *Urbanization, *Surface runoff, Storm ater, Water pollution sources, Riparian rights, rplus water, Depression storage, Impoundents, Ponding, Retention, Watershed manageent, Surface groundwater relationships, Water w, Legal aspects, Constitutional law.

torm water runoff is a serious problem in urban eas and may constitute a significant source of ater pollution. The solution to storm water ruoff difficulties seems to be the detention of aters in higher lands for longer periods, coupled ith drainage improvements in lower areas. Detntion of water in upper land areas, however, inolves the possibility of constitutional taking of roperty. In addition, increased drainage on lower nds often requires costly acquisitions of flood sements over private property. Flood insurance gislation has led to a new awareness of flood ain zoning, and the local responses indicate that e problems can be solved. Flood water pollution another matter. Zero pollution goals prevent ruoff into waterways but detention of water often sults in pollution of groundwater. Probably chnological advances will provide a solution. Comer-Florida)
77-01098

HE NATIONAL FLOOD INSURANCE ACT OF 968 AND FLOOD PLAIN ZONING IN ARKANAS, NEBRASKA, NORTH DAKOTA, MISSISPPI, TENNESSEE, SOUTH DAKOTA, AND ANSAS,
lorida Univ., Gainesville. School of Law.
A. Rasmussen.
vailable from Eastern Water Law Center, niversity of Florida, Gainesville, Florida 32611, r $1.60. (1976), 32 p.

escriptors: *Central US., *Design standards, Flood control, *Federal government, *Flood ain zoning, Nebraska, North DAkota, Mississip, Tennessee, South Dakota, Kansas, Legislaon, State jurisdiction, Flood data, Flood damage, lood plain insurance, Flood plains, Land use, uilding codes, Foundations, Safety factors, egulation, Permits, Legal aspects.

he National Flood Insurance Act of 1968 is esntially a voluntary program. Communities and ates wishing to take advantage of the Act must ow that flood control programs meeting inimum federal standards have been impleented. The various states have faced flood conol in different ways. Arkansas, for instance, prodes by statute that each community may enact gislation. If local laws fail to meet federal quirements, however, the state may provide ricter standards. Nebraska has provided its comunities with minimum standards and model ornances all complying with federal law. North akota allows farm buildings in flood plain areas hile Mississippi does not. North Dakota's law is, erefore, federally in-adequate and dangerous. omparison of the above plans with those of other ates such as Tennessee, South Dakota, and Kans shows the strengths and weaknesses of each d may suggest the best method to be used by her states. (Comer-Florida)
77-01099

EDEVELOPMENTS ON THE OCEANFRONT,
orida Univ., Gainesville. School of Law.
. A. Pope.
vailable from Eastern Water Law Center, niversity of Florida, Gainesville, Florida 32611, r $2.40. (1976), 48 p.

escriptors: *Permits, *Florida, *Hurricanes, igh water mark, *Structures, Tides, Coasts, uildings, Construction, Riparian rights, Accretion(Legal aspects), Erosion, Avulsion, Beds, Damages, Watercourses(Legal aspects), Tidal waters, Ownership of beds, Boundaries(Property), Navigable waters, Coastal structures.
Identifiers: Public trust doctrine.

Private ownership of oceanfront property carries certain rights and restrictions as regards development of the property. Once the property has been developed, the question may arise as to whether such development may be restored if it is partially or wholly destroyed. The author examines the issues involved in Florida in rebuilding structures damaged or destroyed by hurricanes, including the problem that arises when the mean high water line has been moved shoreward of the structure by tidal action. The applicable state and federal laws are reviewed and pertinent case decisions are discussed. Various arguments open to the land owner are examined. In most cases permission to rebuild would depend on a combination of factors, including nearness to the mean high water line, the possible environmental damage, and the potential for interference with public rights. (Capehart-Florida)
W77-01100

WATER MANAGEMENT AND ADMINISTRATION IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT,
Florida Univ., Gainesville. School of Law.
C. Hardee.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $3.70. (1976), 74 p, 7 tab, 1 fig, 3 append.

Descriptors: *Water management(Applied), *Florida, *Well regulations, *Well permits, Wells, Legislation, Administrative agencies, Water use, Water law, Drilling, Water sources, Water resources, Water resources development, Permits, Groundwater, Groundwater resources, Groundwater potential, Management.
Identifiers: *Florida Water Resources Act of 1972.

A landowner faces many problems in building a water well field for municipal supply. Specifically, the landowner is concerned with possible legal consequences of the lowering of lake and ground water levels which may result from his pumping activities. As a preliminary guide to understanding the problem, background principles of groundwater hydrology and geology are given in condensed form. The common law development of groundwater rights is then examined, as well as statutory modifications of that doctrine in Florida. Special emphasis is placed on the water management policies of the Southwest Florida Water Management District (SWFWMD) and on the rules and regulations of the Florida Water Resources Act of 1972. To provide a brief overview of SWFWMD administrative procedures, a case study in water management and administration is presented, using the District's rules and regulations as parameters for a well construction problem. Finally, a sample application package for SWFWMD consumptive use permits is presented.
W77-01101

COASTAL CONSTRUCTION AND OTHER PHYSICAL ACTIVITIES SEAWARD OF THE MEAN HIGH WATER LINE,
Florida Univ., Gainesville. School of Law.
T. Tomasello.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $3.70. (1976), 74 p, 3 fig, 2 append.

Descriptors: *Landfills, *Construction, *Florida, *Dredging, *Permits, Coasts, Erosion, Shore protection, Tidal effects, Waves(Water), Seashores, Oceans, Sand bars, Sand spits, Legislation, Beach erosion, State governments, Local governments.
Identifiers: *Coastal zone management, *Coastal waters, *Licenses.

Florida and federal legal problems associated with two different types of proposed coastal construction are explored, with the emphasis placed on state regulation. A hypothetical situation is posed in which a hotel owner wishes to increase his beach area by either constructing a groin or extending his upland seaward by means of dredging and filling. The complexities of such an operation have grown considerably in that government has become more concerned with the coastal environment. To illustrate this increased government involvement, a history of Florida regulations concerning coastal lands, as well as a discussion of the trust doctrine and the interpretation of 'public interest' is presented. Regulatory schemes presently in force in Florida are also discussed. They are broken down separately to cover groin construction and dredge and fill activities. Today in Florida as many as nine state and federal permits may be required for the project. However, because the hotel owner will probably not be able to demonstrate that the construction will benefit the public interest, it is unlikely that the permits will be issued. (Frank-Florida)
W77-01102

COMMISSION FOR OCEAN ADVANCEMENT THROUGH SCIENCE AND TECHNOLOGY.
Alas Stat Ann secs 46.26.010 thru 46.26.100 (1971).

Descriptors: *Water resources development, *Administrative agencies, *Alaska, *Water allocation(Policy), *Project planning, Beneficial use, Water pollution control, Water quality, Water supply, Regulation, Programs, Project feasibility, Social function, Water management(Applied), Environmental effects, Legislation, Environmental control, Project purposes, Local governments, Social impact, Alternative planning.

Alaska has enacted legislation creating in the Office of the Governor the Commission for Ocean Advancement Through Science and Technology. The Commission's purpose is to develop a comprehensive state plan for the orderly, long range conservation and development of marine and coastal resources. This will ensure their wise multiple use in the public interest. Commission members are empowered to implement the plan. To begin, the Commission shall undertake a comprehensive investigation and study of all aspects of the marine sciences and the marine and coastal environment in and proximate to the state, including: (1) a review of the known and estimated future needs for natural resources from the marine and coastal environment; (2) a survey of all significant existing and planned marine science activities in the state; (3) a determination of what the state policies, programs and laws should be regarding all social, economic, and legal matters relative to the conservation and utilization of ocean resources; and (4) a determination of the surveys, applied research programs and ocean engineering projects required to obtain the needed natural resources from the marine and coastal environment. (Lauer-Florida)
W77-01103

COMMISSION ON THE CONFERENCE OF THE LAW OF THE SEA.
Alas Stat Ann secs 44.19.789 thru 44.19.799 (1967).

Descriptors: *Alaska, *Resources development, *Natural resources, *Legislation, *Law of the sea, Conferences, State governments, Mineralogy, Oil, Natural gas, Fish, Shellfish, Administrative agencies, Jurisdiction, Legal aspects, Grants, Beds, Coasts, Oceans, Governmental interrelations, State jurisdiction, Conservation.

The Alaska legislature has created a seven member commission on the Conference of the Law of the Sea. The commission has the responsibility for compiling and analyzing data on resources in the sea or seabed off the Alaskan coast. It is also charged with development of state

positions on management, utilization and conservation of marine resources such as minerals, oil and gas, and fish and shellfish. It is also charged with the establishment of maximum jurisdictional limits for the state. The commission has a further duty of assuring fair representation for the state in the 1973 Conference on the Law of the Sea and subsequent conferences. The commission is also authorized to enter into agreements with other coastal states for the development and conservation of marine resources. (Capehart-Florida)
W77-01104

PUBLIC LANDS (LEASING OF MINERAL RIGHTS IN STATE OWNED TIDAL AND SUBMERGED LANDS).
Alas Stat Ann secs 38.05.250 thru 38.05.255 (1973).

Descriptors: *Alaska, *Mining, *Beds, *Permits, *Leases, Exploration, Mineralogy, State governments, Administrative agencies, Mills, Rent, Timber, Mine wastes, Ownership of beds, Bids, Contract administration, Legal aspects, Legislation, Contracts, Tidal marshes.
Identifiers: *Tidelands.

The right to explore tide and submerged state lands for minerals may be granted by a permit. The maximum area of exploration is 2,560 acres with rental paid on a per acre basis. Such rental may be offset by useful expenditures on the permitted land. Under a prospecting permit, limited amounts of minerals may be mined for purposes of sampling and testing. If minerals are discovered, the permit holder may acquire a non-competitive mineral lease for that portion of the permitted land shown to contain mineral deposits. Submerged lands containing known deposits may be leased by competitive bids. Mineral leases are for a maximum term of 55 years with a yearly rental of $1/acre adjustable every 20 years. Surface uses of land or waters by the owner of the mineral rights shall be limited to those uses necessary to exploration, mining, or processing. Permits may be granted for millsites and tailings disposal. (Capehart-Florida)
W77-01105

PUBLIC LANDS (PREFERENCE RIGHTS ESTABLISHED FOR ACQUISITION OF TIDELANDS AND SUBMERGED LANDS).
Alas Stat Ann secs 38.05.320, 38.05.365 (1973).

Descriptors: *Alaska, *Preferences(Water rights), *Boundaries(Property), *Ownership of beds, Public access, Priorities, State governments, Cities, Beds, Seashores, Tidal waters, Leases, Right-of-way, Navigation, Real property, Land tenure, Legislation, Legal aspects.

The Alaska legislature is establishing preference rights for the acquisition of tidelands and submerged lands occupied or developed prior to the date of statehood. Cities may apply for a conveyance from the state of submerged lands seaward of the city. Preference rights are classified for occupants of land conveyed to the cities by the state. Cities conveying submerged lands to occupants shall convey additional unoccupied land where reasonably necessary for the use and enjoyment of the occupied land unless development of the land would interfere with navigation. Cities may sell or lease tidelands if no preference right has been granted for them. Rights-of-way shall be reserved if necessary to provide access to public waters. Preference rights are classified for occupants of submerged lands not seaward of a city. (Capehart-Florida)
W77-01106

UNITED STATES V KAISER AETNA (DEVELOPMENT CHANGING NATURE OF POND FROM PRIVATE TO SUBJECT TO PUBLIC NAVIGATION SERVITUDE).
408 F Supp 42-55 (D Ha 1976). 14 p.

Descriptors: *Hawaii, *Judicial decisions, *Navigabile waters, *Public access, Easements, Public rights, Excavation, Construction, Landfills, Riparian rights, Navigation, Rivers and Harbors Act, Federal government, Water law, Permits, Control, Legal aspects, Water policy, Water rights, Legislation.
Identifiers: *Water rights(Non-riparians), *Navigational servitude.

Plaintiff United States sought a declaratory judgment that the waters of defendants' pond, generally known as Hawaii-Kai Marina, were navigable waters of the United States and that defendants were, therefore, required to obtain authorization for any construction, excavation, or filling. Plaintiff also sought an injunction to prevent the defendants from interfering in any way with public access to the waters of the marina. The U. S. District Court held that fishponds in Hawaii are of a private nature, and ownership of such ponds includes the right to exclude the public. However, since the marina was used in interstate commerce and had become the legal equivalent of a toll-charging channel or harbor, it was subject to regulation by the Corps of Engineers under the Rivers and Harbors Act, as well as to improvement and regulation for navigation. Thus a public navigation servitude could be imposed upon the privately constructed waterway after paying reasonable compensation. (Reinders-Florida)
W77-01107

COUNTY AND MUNICIPAL POLLUTION CONTROL FACILITIES.
Ark Stat Ann secs 13-1901 thru 13-1903, 13-1912 (Cum Supp 1975).

Descriptors: *Treatment facilities, *Arkansas, *Legislation, *Water policy, *Water pollution treatment, Water quality control, Air pollution, Sewage, Chemical wastes, Domestic wastes, Industrial wastes, Municipal wastes, Water pollution, Pollution abatement, Water quality standards, Environmental sanitation, Environmental engineering.

Arkansas has enacted legislation providing for county and municipal pollution control facilities. Pollution control facilities have been determined to be essential to promote the health, safety and physical welfare of the state and to secure the development of industry. Therefore, any municipality or county is authorized to own, acquire, construct, equip, improve, maintain, sell, lease, contract or otherwise deal in facilities for the disposal or control of sewerage, water pollution or air pollution. To obtain the permanent financing necessary to accomplish pollution control, municipalities and counties are authorized to expend any available revenues and to issue bonds of the amount necessary for payment of any costs, including incidental costs. This act is intended for liberal construction, but nothing in this act is to be construed to authorize any municipality or county to sell bonds or to use the proceeds to condemn or purchase any distribution system controlled by a regulated public utility. (Comer-Florida)
W77-01108

WATER RIGHTS REGISTRATION.
Ariz Rev Stat Ann secs 45-180 thru 45-193 (Supp 1975).

Descriptors: *Arizona, *Legislation, *Water rights, *Appropriation, *Prescriptive rights, Relative rights, Administrative agencies, Competing uses, Water allocation(Policy), Water contracts, Water utilization, Water consumption(Except Consumptive use), Consumptive use, Water permits, State jurisdiction, Water law.
Identifiers: *Water rights(Non-riparians).

Arkansas has enacted legislation providing that any person, partnership, association, public or private corporate state or subdivision agency municipality claiming right to use or withdraw a water from any source for domestic, municip recreational, wildlife, agricultural, power, mini or stockwatering use must file claim of that right proper form. Failure to file the claim constitu relinquishment of the right but does not constitu any adjudication of any conflicting claim. The f ing requirement does not apply to any water righ issued pursuant to permit, to rights acquired contract with the federal government, or to righ to use Colorado River waters. To insure that fected persons are properly notified of fili necessity, proper publication of notice is require A water claims registry shall be established receive such claims. No adverse possession water rights shall exist since establishment claims is by filing only. If it appears that anyo having right to use waters fails in whole or in p to use the permitted amount, the unused porti shall be subject to appropriation. (Comer-Florida
W77-01109

DEPARTMENT OF NATURAL RESOURCES ELDRIDGE R. FRANCE (ESTABLISHMENT COUNTY BOUNDARY AS THALWEG INSTEA OF GEOGRAPHIC CENTER OF RIVER).
357 A2d 78-99 (Md Ct App 1976). 22 p.

Descriptors: *Maryland, *Boundaries(Property *Rivers, *Thalweg, *Oysters, Ownership of bed Non-navigable waters, Harvesting, Judicial de sions, Jurisdiction, Law enforcement, Channe Navigable waters, Constitutional law, Legislatio Boundary disputes, Local governments, Char Maps, Hydrolgraphs.
Identifiers: *Wicomico River(Md).

Plaintiff state agency brought charge against fendant oysterman for unlawful oyster dredging the Wicomico River. The charge was subsequen dismissed for lack of jurisdiction in the cou where the charge was brought. For venue p poses, plaintiff then sought a judicial determi tion of the boundary line between two counti separated by a navigable river. The trial court de sion, which was affirmed at the first appell level, held that the boundary line was the g graphic center of the river as shown on cou topographic maps. The Court of Appeals of Ma land, however, held that the boundary line is t thalweg or midline of the main river channel a that the proper maps were the hydrograp charts. In an extended opionion, the court e amined United States Supreme Court decisio and the decisions of a number of state courts they pertain to river boundaries. (Capeha Florida)
W77-01110

KELLY RANCH V SOUTHEASTE COLORADO WATER CONSERVANCY D TRICT (PLAN OF AUGMENTATION DEVELOPER).
550 P2d 297-308 (Colo 1976). 12 p.

Descriptors: *Colorado, *Water supply develo ment, *Water allocation(Policy), *Water distric *Water supply, Water conservation, Water d tribution(Applied), Water management(Applie Well permits, Well regulations, Water righ Water permits, Water policy, Water resource Water resources development, Water users, C sumptive use, Planning.

Plaintiff residential developer had sought appro of a plan to increase his supply of water development of new or alternate means of wa resources. The plan was rejected by the wa court and the plaintiff appealed. The plan for a mentation called for the developer to remove p manently 14 acres of native pasture and to use t water which had historically been used for irri tion of that acreage to replace water to be c sumptively used in the proposed resident development. The plan also provided for stori

e of the water normally used in the irrigation on for year-round use to prevent injury to s in the area. The defendant water district con- ed that any acceptable plan for augmentation ired the addition of new water into the water em. The Supreme Court of Colorado held that water need not be injected into the water em to validate a plan for augmentation. Since laintiff had met his burden of proving that the unt of return flow from in-house use of the water was as stated and since possible pollu- effects of the plan were not at issue, the court oved the augmentation plan. (Welch-Florida)
-01112

VERLEAF FARMS, INC V SURRATT MMON ENEMY DOCTRINE: SURFACE TER).
NE2d 731-32 (Indiana Ct App 1976). 2 p.

riptors: *Indiana, *Adjacent land owners, ns, *Alteration of flow, *Judicial decisions, harge(Water), Legal aspects, Common law, ding waters, Surface waters, Damages, Con- tion, Flow augmentation, Flood damage, d discharge, Land.
tifiers: *Common Enemy Doctrine.

tiff property owner sought damages for ge of drainage of surface water caused by truction by defendant adjacent land owner. plaintiff contended that the defendant's hous- construction had caused surface water which previously flowed across its own land to stand laintiff's land. The defendant contended that landowner it was not liable for damages aris- rom a change in the flow of surface water oc- ned by alterations on its own land. In rsing the lower court and finding for the de- ant, the First District Court of Appeals of In- a relied on the 'Common Enemy Doctrine' lower property owners may dam against sur- water to prevent its flowing onto their land thus cannot be held liable for damages result- rom the accumulation of water above the con- tion or because such obstruction causes the r to flow onto the lands of others. The court d an exception to the doctrine to the effect, a land owner may not collect water in a body then discharge it onto another's land. (Rieck- ida)
-01113

TE EX REL BROWN V ROCKSIDE RECLA- TION (STATUTE PROVIDING FOR GRANT- OF PERMITS RELATING TO WATER LUTION CONTROL--APPLICATION).
NE2d 448-54 (Ohio 1976). 7 p.

riptors: *Ohio, *Water permits, *Public th, *Water pollution control, *Water quality rol, *Odor, Air pollution, Odor-producing e, Public rights, Water quality standards, l aspects, Judicial review, Administrative cies, Waste treatment, Waste disposal, Solid es, Water injury.
tifiers: *Administrative regulations, uisance(Legal aspects).

tiff attorney general brought this action in ance to enjoin defendant solid waste disposal operator from operating its disposal site. The tiff alleged that the defendant was depriving ens of the beneficial use of state waters and giving off odors in violation of state law. The Supreme Court held that the statute relating ffensive smells as being injurious to public th and comfort was a general nuisance provi- and was not applicable to a duly licensed solid e disposal operation. When the legislature orizes acts to be done which previously would constituted a nuisance, such acts no longer egally a nuisance insofar as the public is con- ed. The court further found that the defendant solid waste disposal operation, did not place waste into any body of water or upon any bank. Finally, the statute providing for permits relating to water pollution regulation did not control because the site was licensed by the director of the Environmental Protection Agency; therefore, its operation would follow prescribed Agency's procedures. (Welch-Florida)
W77-01114

COUNTRY KNOLLS WATER WORKS, INC V REID (LIMITATION OF OUTPUT OF PRIVATE WATER SUPPLIER'S WELL).
383 NYS2d 661-65 (App Div 1976). 5 p.

Descriptors: *Well permits, *New York, *Well regulation, *Well data, *Water management(Applied), Wells, Water control, Water storage, Water conveyance, Water permits, Regulation, Water pollution control, Water pressure, Legal aspects, Permits, Administrative agencies, Pipes, Pumping.
Identifiers: *Administrative regulations, Evidence.

Plaintiff private water supplier brought this action to review the determination by defendant commissioner of the Department of Environmental Conservation which modified plaintiff's application to expand his water system, thereby limiting the output of plaintiff's well. The plaintiff sought application for the approval of two new wells, but the application was denied on the grounds that inadequate information was available concerning possible environmental effects of such construction. The plaintiff contended that the challenge was not based on substantial evidence. The court held that a private water supplier could not be required to maintain minimum water pressure throughout the consumer's system. In this case, though, rationality being the test to find substantial evidence, the commissioner was justified in limiting plaintiff's output. The court then went on to state that the storage capacity requirement must be based upon design average consumption and not upon peak demand consumption. (Welch-Florida)
W77-01115

LEASES OF LAKES, PONDS, STREAMS AND RESERVOIRS.
Okla Stat Ann, tit 11, secs 321 thru 322 (1959).

Descriptors: *Fish establishment, *Oklahoma, *Leases, *Lakes, *Recreation, Ponds, Streams, Reservoirs, Local governments, Cities, Legislation, Water supply, Hunting, Fishing, Commercial fishing, Public access, State government, Legal aspects, Water utilization, Fish hatcheries, Fisheries.

Municipalities in the state of Oklahoma which own or control lakes or watercourses for water supply purposes may lease or issue licenses for the use of these bodies of water for hunting, fishing, or the propagation of fish. The maximum period for such a lease will be ten years. If the terms of the lease allow the public free hunting and fishing privileges, however, the maximum period may be for twenty-five years. No lease shall be issued to allow the propagation of fish for commercial purposes. (Capehart-Florida)
W77-01116

WATER POWER COMPANIES--EMINENT DOMAIN,
Okla Stat Ann tit 27, sec 4 (1958).

Descriptors: *Oklahoma, *Eminent domain, *Hydrolelectric plants, *Sites, *Dams, Non-navigable waters, Streams, Water storage, Right-of-way, Flumes, Conduits, Water conveyance, Electric power, Transmission lines, Transmission(Electrical), Powerline carriers, Facilities, Conveyance structures.

The power of eminent domain granted to any water power company in the state of Oklahoma to acquire sites to erect power plants and dams over non-navigable streams, and to acquire sites for water storage. The power of eminent domain is also granted to these companies for the purpose of acquiring rights-of-way for water conveyance structures and electrical transmission systems. (Capehart-Florida)
W77-01117

MINING AND MANUFACTURING CORPORATIONS.

Descriptors: *Oklahoma, *Mineral industry, *Ditches, *Water utilization, Mining, Flumes, Tunnels, Right-of-way, Diversion, Damages, Mills, Irrigation, Streams, Water conveyance, Priorities, Mineralogy, Excavation, Mining engineering, Diversion structures, Routing, Legislation.

The articles of incorporation of a corporation formed to construct a ditch to carry water to any mines or mills or to lands for irrigation must specify the stream and the place on the stream from which water is to be taken, the line of the ditch, the intended use of the water, and the route and purpose of any flume. Ditch corporations are given the right-of-way over the ditch line and the right to divert stream waters through the ditch so long as there is no interference with pre-existing ditches or water rights. The ditch must be constructed and maintained so that water will not escape and injure any property. Corporations formed to construct mining tunnels must specify the course of the tunnel and the minerals to be excavated. Any corporation which fails to commence construction within 90 days or complete its work within two years shall forfeit all right to the route. (Capehart-Florida)
W77-01118

WATER AND WATER RIGHTS,
Cal Const Art 14 secs 1,3,4.

Descriptors: *Beneficial use, *California, *Water rights, *Riparian rights, *Land tenure, Appropriation, Public use, Constitutional law, Water conservation, Water resources, Conservation, Diversion, Regulation, Federal government, Legal aspects, Legislation, Streams, Governments.

California has enacted legislation providing that the use of appropriated water is a public use subject to conserve and preserve the water resources of the state. Thus, a riparian land owner has the right to reasonable use of stream waters adjacent to his property if he utilizes reasonable diversion methods. However, riparian rights in a stream only attach to so much of the flow of water as is required for a reasonable use of the land. Furthermore any governmental agency which acquires an interest in real property in the state must conform to the state laws regarding the acquisition, control, use, and distribution of water with respect to the land so required. (Capehart-Florida)
W77-01119

NAVIGABLE WATERS (DEFINITION, ENUMERATION AND OFFENSES).
Cal Harbors and Navigation Code Ann secs 90 thru 152 (West 1955), as amended, (Supp 1976).

Descriptors: *California, *Navigable waters, *Penalties(Legal), *Public access, *Legislation, Coasts, Streams, Transportation, Trespass, Rivers, Harbors, Sawdust, Wastes, Oil, Trees, Navigation, Negligence, Legal aspects.
Identifiers: *Navigation obstructions, Oil spill cleanup.

California has enacted legislation providing that streams large enough for the transportation of commercial products are to be deemed public ways for navigational purposes. However, when a

navigable course is in floodstage, the waters flowing outside the established boundaries of the watercourse are not navigable. The navigable waters of the state are enumerated and the extent of navigability of each is described. Unlawful acts with regard to navigable waters include: the obstruction of navigable waters by felling trees; any obstruction of navigable waters; the dumping of ballast into a harbor; the non-emergency or non-accidental discharge by a vessel of fuel oil into navigable waters; and the depositing of sawdust or refuse in Humboldt Bay. A civil penalty is established for the intentional or negligent discharge of oil into any state waters and liability is imposed for clean up costs. (Capehart-Florida)
W77-01120

WATER POLLUTION PROHIBITED.
Cal Fish and Game Code Ann secs 5650 thru 5803 (West 1958), as amended, (Supp 1976).

Descriptors: *California, Water pollution, *Legislation, *Water pollution control, *Public health, Pollution, Oil, Wastes, Sawdust, Industrial wastes, Toxicity, Sewage wastes, Water quality control, Shellfish, Administrative agencies, Law enforcement, Inspection, Mine wastes, Hydraulic mining, Rivers, Permits, Dredging, Abatement.

California has enacted legislation for the purpose of preventing and controlling water pollution. Prohibitions are placed on the deposit or discharge into state waters of certain substances including industrial wastes, factory refuse, petroleum products or residues, and other materials harmful to fish, plant or bird life. The dumping of cans, bottles, garbage, and junked vehicles into state waters is also prohibited. Correction of chronic water pollution conditions is the responsibility of regional water pollution control boards. Permits from the Department of Fish and Game are required for the use of dredge equipment in state waters. The Department of Public Health is responsible for the inspection of shellfish beds. If the beds are contaminated so that public health would be endangered by their use, the department is required to prevent and to post notices prohibiting the taking of shellfish from the area. Also, mining operations in the Trinity and Klamath River Fish District are to be conducted so as to prevent the pollution or contamination of the waters in the district from July through November. (Capehart-Florida)
W77-01121

POLLUTION OF NAVIGABLE WATERS.
Cal Health and Safety Code Ann secs 4400 thru 4468 (West 1970), as amended (Supp 1976).

Descriptors: *California, *Waste disposal, *Navigable waters, *Legislation, *Water supply, Radioactive waste disposal, Boats, Penalties(Legal), Water pollution, Public health, Inspection, Sewage disposal, Law enforcement, Septic tanks, Livestock, Swimming, Waste disposal wells, Aquifers, Reservoirs, Fishing, Permits, Grazing.
Identifiers: Houseboats, Nuisance(Legal aspects), Injunctive relief, Ocean dumping, Ocean disposal.

California has enacted legislation prohibiting the dumping of garbage into navigable waters of the state. It is a misdemeanor to load or to permit garbage to be loaded on a vessel for dumping in navigable waters. Procedures are established for the carrying of a health inspector by vessels engaged in ocean disposal of garbage or radioactive wastes. Furthermore, vessels operating in navigable waters or tied to a dock having toilet facilities shall not discharge any human excreta into navigable waters. Activities which cause or might cause contamination of a stream, pond, lake or reservoir serving as a source of water supply are prohibited. Such activities include bathing, washing clothes, septic tank drainage, or livestock pollution. However, public fishing may be allowed on publicly owned reservoirs used for drinking water purposes if the water quality is not affected and if permitted by the State Department of Health. (Capehart-Florida)
W77-01122

MILLER ANTI-POLLUTION ACT OF 1971 (ABSOLUTE LIABILITY OF PETROLEUM CARRIER).
Cal Harbors and Navigation Code sec 293 (West Supp 1976).

Descriptors: *Boats, *Navigable waters, *California, *Oil spills, *Transportation, *Oil industry, Ships, Damages, Natural resources, Marine biology, Wildlife, Navigable waters, Jurisdiction, Oceans, Governments, Oil pollution, Water pollution, Water pollution sources, Legislation.
Identifiers: *Absolute liability.

California has enacted legislation providing that the owner or operator of any vessel which transports petroleum or fuel oil on a commercial basis shall be absolutely liable without regard to fault for any property damage within the state. Furthermore, such owner or operator shall be liable for any damage or injury to the natural resources of the state which is caused by the discharge or leakage of petroleum or fuel oil from the vessel into the navigable waters of the state. Such liability is imposed when the damage is caused directly or proximately by acts of the owner or operator and not when the cause can be attributed to the actions of another agency which were not foreseen or foreseeable. (Capehart-Florida)
W77-01123

HISTORY AND DEVELOPMENT OF MULTIPLE OBJECTIVE PLANNING FOR WATER RESOURCES,
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-01152

THE ATTITUDE AND INTEREST OF THE ENVIRONMENTAL PROTECTION AGENCY IN MULTIPLE OBJECTIVE PLANNING OF WATER AND RELATED LAND RESOURCES,
Environmental Protection Agency, Washington, D.C. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W77-01153

EMERGING CORPS OF ENGINEERS GUIDELINES FOR IMPLEMENTING THE PLANNING REQUIREMENTS OF WRC'S PRINCIPLES AND STANDARDS AND RELATED POLICIES,
Corps of Engineers, Washington, D.C. Planning Div.
For primary bibliographic entry see Field 6B.
W77-01154

IMPLEMENTATION OF MULTIPLE OBJECTIVE PLANNING BY THE SOIL CONSERVATION SERVICE,
Soil Conservation Service, Washington, D.C. River Basin.
For primary bibliographic entry see Field 6B.
W77-01155

PHILOSOPHY OF MULTIPLE OBJECTIVE PLANNING IN THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-01156

THE TENNESSEE VALLEY AUTHORITY A MULTIPLE OBJECTIVE PLANNING,
Tennessee Valley Authority, Norris. Div. of Wa Control Planning.
For primary bibliographic entry see Field 6B.
W77-01157

THE DEPARTMENT OF TRANSPORTATIO USE OF MULTI-OBJECTIVE PLANNING,
Department of Transportation, Washington, D.
For primary bibliographic entry see Field 6B.
W77-01158

IMPLEMENTATION OF MULTI-OBJECTI PLANNING IN THE DEPARTMENT OF CO MERCE,
Department of Commerce, Washington, D.C. fice of Policy Development and Coordination.
For primary bibliographic entry see Field 6B.
W77-01159

CONCERNS OF THE U.S. FISH AND WILDL SERVICE IN MULTI-OBJECTIVE PLANNIN
Bureau of Sport Fisheries and Wildlife, Washi ton, D.C.
For primary bibliographic entry see Field 6B.
W77-01160

THE USE OF MULTIPLE OBJECTI PLANNING IN THE BUREAU OF LA MANAGEMENT,
Bureau of Land Management, Denver, Colo.
For primary bibliographic entry see Field 6B.
W77-01161

PERSPECTIVE AND ROLE OF T ECONOMIC RESEARCH SERVICE IN MUL PLE OBJECTIVE PLANNING,
Department of Agriculture, Lincoln, Nebr.
For primary bibliographic entry see Field 6B.
W77-01162

THE GROUND WATER LEGAL REGIME INSTRUMENT OF POLICY OBJECTIVES A MANAGEMENT REQUIREMENTS,
City Univ. of New York.
R. D. Hayton.
In: Proceedings of the International Confere On Water Law and Administration, Internati Association for Water Law, February 8-14, 1 Caracas, Venezuela; Published by the Comm sion for The National Water Resources Devel ment Plan (Coplanarh), Caracas, Venezuela 272-293, 1976. 22 p.

Descriptors: *Water quality cont *Groundwater availability, *Groundwa *Foreign countries, *Well regulations, Grou water mining, Groundwater potential, Grou water resources, Permits, Regulation, Water lution, Water allocation(Policy), Water ta Water table acquifers, Water users, Water we Legal aspects.

Legal systems around the world have long trea ground water as a system apart, and h developed rules and regulations that do not refl ground water's relationship with the water syst of a nation as a whole. Also, each country's l are different. For example, Islamic law preve wells from being dug too close to one already existence. In Spain, rights to ground water dep on the nature of the overlying land whether i public or private; and many European count follow the rule that ground water belongs absol ly to the owner of the overlying land, accordin the principle that land ownership includes titl everthing in the subsoil. Recent trends in grou water law indicate that restrictions on the limited title are being imposed. For instance, following are becoming prevalent: use limitatio quantity of extraction limitations; drilling perm

rictions and standards; use licenses; zones of servation or prohibition; and reporting and re-ering requirements. The world's nations are coming to the point of view that as surface r availability diminishes through pollution, ter steps must be taken to protect ground r resources. (Frank-Florida)
-01181

SUBURBAN MODEL OF RATIONAL OUND WATER UTILIZATION: A PLAN FOR SAU COUNTY,
Univ. of New York.
primary bibliographic entry see Field 4B.
-01182

INTERFACE BETWEEN PLANNING AND TER LEGISLATION,
Viener.
Proceedings of the International Conference Water Law and Administration, International ociation for Water Law, February 8-14, 1976, acas, Venezuela; Published by The Commis- for the National Water Resources Develop- t Plan (Coplanarh), Caracas, Venezuela, p 432, 1976. 25 p.

criptors: *Foreign countries, *Long-term ning, *Water conservation, *Legal aspects, ter supply development, *Water demand, rt-term planning, Planning, Water utilization, r appropriation, Beneficial use, Cost-benefit y, Cost analysis, Cost comparisons, Water urces development, Water law.

er legislation has adhered to traditional legal rines that were suited to the water resources ation of hundreds of years ago. Today is an era ollution and an ever-decreasing water supply. ough society has been served well in the past, ajor effort must be made to establish new ria which are compatible with anticipated fu- regulative needs of the water resource em. Large obstacles will be in the way of any l changes, including institutional inertia, ed interests, and the lack of requisite informa- For instance, prior appropriation doctrines not likely to be easily changed when lan- ners have been relying on them for hundreds ears. The fact that they may not be the most cient method of handling the water resources not disturb those who are benefitting from the ent system. The author favors a change to a d generalize type of legislation, leaving a wide retionary range to the proper administrative cies. Furthermore, he warns that systems l for rich societies will not necessarily work oor ones. (Frank-Florida)
-01183

TER LAW AND NEW TECHNOLOGIES.
ed Nations, New York.
Proceedings of the International Conference Water Law and Administration, International ociation for Water Law, February 8-14, 1976, acas, Venezuela; Published by The Commis- For The National Water Resources Develop- t Plan (Coplanarh), Caracas, Venezuela p 434-1976. 21 p, 24 ref.

criptors: *Desalination, *Technology, *Water ly, *Water supply development, Water con- ation, Water demand, Industries, Industrial ts, Industrial water, Water utilization, Cool- Cooling water, Desalination processes, Sur- water, Ground water, Zoning, Legal aspects, er resources development, Water resources.

ent technological advancements may serve to ease water demand. For example, the use of ooling systems that employ closed cycles in- d of consuming large quantities of freshwater help lower demand, as will the industrial use rackish water for cooling purposes. The im- ement of wind-generation techniques and the expansion of cooling ponds, as well as the new drip irrigation, should also help curb the growing need for water. A more efficient use may be made of water. A more efficient use may be made of water through re-use techniques. Industry, which is one of the largest water users, is beginning to find second and even third uses for water within a single plant, even if such re-use require some in-house treatment. Water supply can also be increased by better desalination techniques, cloud seeding and long-distance transportation of water from high to low rainfall areas. Water law itself must better integrate surface water with ground water, as today they are treated as two distinct systems when they are really part of the same cycle. Zoning and soil management must become integrated with water management as well. Finally, the law must assess new technologies and decide which ones will be developed, restricted, blocked or fostered. (Frank-Florida)
W77-01184

LEGAL PROBLEMS ASSOCIATED WITH THE ROLE OF PLANNING IN WATER RESOURCES MANAGEMENT,
Melbourne Univ., Parkville (Australia). College of Law.
S. D. Clark.
In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (Coplanarh), Caracas, Venezuela, p 460-488, 1976. 29 p, 12 ref, 1 append.

Descriptors: *Comprehensive planning, *Long-term planning, *Legal aspects, *Decision-making, *Water resources, Short-term planning, Project planning, Project benefits, Political aspects, Political constraints, Management, Administration, Programs, Projections.

Defined planning criteria and procedures are not always observed in public and private water development proposals. This failure to include desired or necessary input greatly reduces the effectiveness of the proposals. It is, therefore, the province of the law to make sure that these criteria and procedures are observed. Since legal techniques and institutions cannot guarantee wise decisions, the law must ensure that decision makers are adequately informed and give proper consideration to relevant criteria. The author contends that the ultimate decision on a proposal is properly political; he does not wish to push the law into that decision-making process. Nevertheless, the law should force the examination of all possible results. In discussing the political process, the roles of the leislature, executive and the courts are examined in connection with their difficulties in imposing planning procedures. Practical problems of drafting legislation to define planning procedures are also considered. (Frank-Florida)
W77-01185

FLORIDA'S SYSTEM FOR REGULATION OF WATER USE--A MODERN INSTRUMENT FOR SOUND WATER RESOURCE MANAGEMENT,
Florida Univ., Gainesville. Coll. of Law.
F. E. Maloney.
In: Proceedings of the International Conference on Water Law and Administration, International Association For Water Law, Feb 8-14, 1976, Caracas, Venezuela. 21 p, 2 append.

Descriptors: *Florida, *Legislation, *Administrative agencies, *Water resources development, *Water permits, *Planning, *Water utilization, Administration, Legal aspects, Water use, Groundwater utilization, Prior appropriation, Riparian rights, State governments, Water resources.
Identifiers: *Florida Water Resources Act of 1972.

Two different systems for regulating water use have developed in the United States: the riparian system in the East, and the prior appropriation system in the West. Both provide for water rights in perpetuity, as long as the use is proper. Florida has developed a more flexible system under the 1972 Florida Water Resources Act. The system is marked by its reliance on fixed term permits rather than in perpetuity permits. This gives the state the ability to re-evaluate water right priorities as time goes on, instead of being locked into an existing allocation system. The Florida law provides for a two-tiered administrative structure with overall state-level supervision plus regulatory implementation by five water management districts whose boundaries are based on hydrological considerations. Also examined are the standards and considerations that go into the issuance of consumptive use permits, as well as provisions for water shortages and emergencies. The law is noteworthy for its assumption that the public should be the primary beneficiary of water benefits and not merely private persons. Most fixed term permits will undoubtedly be renewed, but the state does have the flexibility to deal with changing water resource conditions. (Frank-Florida)
W77-01186

COOPERATIVE CONTROL OF INTERNATIONAL POLLUTION AND COMMON PROPERTY RESOURCES,
University of Western Ontario, London.
For primary bibliographic entry see Field 5G.
W77-01290

WATER AVAILABLE FOR ENERGY--UPPER COLORADO RIVER BASIN,
Utah State Engineer's Office, Salt Lake City.
For primary bibliographic entry see Field 3E.
W77-01350

SEA FARMING: A MEANS FOR CONTRIBUTING TO FEEDING MANKIND, (IN SPANISH),
Instituto de Biologia Marina, Mar del Plata (Argentina).
E. E. Boschi.
Inst Biol Mar (Mar Del Plata) Ser Contrib. 281, p 1-31, 1974.

Descriptors: Marine organisms, *Fish farming, Foods, Tilapia.
Identifiers: France, Japan, *Sea farming, Spain.

The cultivation of marine organisms for human food will never take the place of commercial fishing since only 3% of the world's ocean surface can be used for this activity. A coastal fringe of not more than 30 m depth offers the best immediate possibilities. The Food and Agriculture Organization (FAO) has estimated that 43 countries in 1972 produced, by ocean and lake farming, 3,700,000 tons of fish and 1,300,000 tons of shellfish, 7.5% of the total production for that year, or 65,000,000 tons. In countries with the greatest resources, artificial production of marine and freshwater animals has developed very slowly. Two principal orientations are meeting basic food demands by producing cheap and easy-to-grow food fishes, such as Tilapia, carp, etc., and growing species of high market value, especially shellfish, such as oysters, scallops, shrimp and lobster. The Spanish mussel industry raises 50% of the world's supply of that shellfish in pools along rivers. Similar examples are cited for France and Japan.–Copyright 1975, Biological Abstracts, Inc.
W77-01421

APPLICATION OF MUNICIPAL BY-LAWS WITH SPECIAL REFERENCE TO DRAINAGE REGULATIONS,
Johannesburg City Engineer's Dept. (South Africa).
For primary bibliographic entry see Field 4A.
W77-01485

RULES AND REGULATIONS: CONFINED FEEDING OPERATIONS.
For primary bibliographic entry see Field 5G.
W77-01512

PROCEEDINGS OF CONFERENCE ON FARM ANIMAL WASTES: 'FARMER EXPERIENCES, CODES, GUIDELINES, RESEARCH PROGRESS, EQUIPMENT'.
Wisconsin Univ.-Madison. Cooperative Extension Programs.
For primary bibliographic entry see Field 5G.
W77-01521

ENVIRONMENTAL POISONS.
For primary bibliographic entry see Field 5C.
W77-01547

6F. Nonstructural Alternatives

ENERGY AND THE COASTAL ZONE: PULLING AND HAULING AMONG THE FEDS,
For primary bibliographic entry see Field 6E.
W77-01081

FEDERAL REGULATION OF DEVELOPMENT IN FLOOD-PRONE WETLANDS--THE ARMY CORPS OF ENGINEERS,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01094

A STUDY OF VARIOUS STATE FLOOD PLAIN REGULATIONS IN AN EFFORT TO EMPHASIZE FLORIDA'S NEED TO EXACT COMPREHENSIVE PLANNING AND LAND USE CONTROLS, WHICH ARE DESIGNED TO AFFORD PROTECTION AGAINST HURRICANE DAMAGE,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01095

USE OF BUILDING CODES: TO REGULATE FLORIDA'S HURRICANE FLOOD PLAIN,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01096

DRAWING THE LINE AT THE OCEANFRONT, THE ROLE OF COASTAL CONSTRUCTION SET-BACK LINES IN REGULATING DEVELOPMENT OF FLORIDA'S COASTAL ZONE,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01097

THE NATIONAL FLOOD INSURANCE ACT OF 1968 AND FLOOD PLAIN ZONING IN ARKANSAS, NEBRASKA, NORTH DAKOTA, MISSISSIPPI, TENNESSEE, SOUTH DAKOTA, AND KANSAS,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01099

WATER MANAGEMENT AND ADMINISTRATION IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01101

COASTAL CONSTRUCTION AND OTHER PHYSICAL ACTIVITIES SEAWARD OF THE MEAN HIGH WATER LINE,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-01102

DEALING WITH VARIABLE FLOOD HAZARD,
Corps of Engineers, Fort Worth, Tex.
J. A. McCrory, L. D. James, and D. E. Jones, Jr.
Journal of the Water Resources Planning and Management Division, Vol. 102, No. WR2, p 193-208, November 1976. 7 fig, 4 tab, 17 ref. Amer. Soc. of Civil Engrs. Proc.

Descriptors: *Flood control, *Flood damage, *Flood plain insurance, *Flood plains, *Regulation, Water resources, Flood frequency, Non-structural alternatives, Management, Hazards.
Identifiers: *Flood hazards.

The National Flood Insurance Program administered by the Federal Insurance Administration, HUD-FHA Minimum Property Standards, and most local flood-plain management programs define flood hazard areas as lands inundated by the 100-year flood. Curves are developed that can be used to manage flood-plain land on an equal damage exposure basis given the stage-frequency relationship for the flood plain and the stage-damage relationship for each property. The issue of acceptable damage exposure is considered through comparisons with fire insurance rates, property taxes, and rates of return on property investments. An examination of the difference between the two indices shows that the equity advantage of management on the basis of damage exposure can be balanced with the administrative advantage of regulation on a frequency basis by continuing to use frequency but varying the return period used according to the damage exposure. (Bell-Cornell)
W77-01343

A TWO-DIMENSIONAL FLOOD ROUTING MODEL,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-01358

EVALUATION REPORT: WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING. DAYTON DEVELOPMENT, PROJECT NO. 287, FOX RIVER, WISCONSIN AND ILLINOIS.
Federal Power Commission, Washington, D.C. Bureau of Power.
May 1976, 42 p, 15 fig, 6 tab.

Descriptors: *Hydroelectric power, *Hydroelectric plants, *Permits, *Illinois, Federal Power Act, Dam failure, *Water resources development, Ice jams.
Identifiers: Licenses, *Fox River(IL), North Counties Hydro-electric Company, Illinois River Basin.

The Dayton hydroelectric project is located on the Fox River, Illinois, 70 mi southwest of Chicago. This report included descriptions of the Fox River Basin, prior reports and current investigations, the economy of the Basin, existing and related water resources developments, a history of the Dayton project (dating to 1920), and future development and utilization. The original license for the project was granted in 1924, to extend for 50 years. Currently North Counties Hydro-Electric Company is the sole licensee (now on annual license). The Illinois Power Company purchases the entire output of the plant. Three times the project operation has been shut down by ice jams in the tailwater area which resulted in claims against the United States for damages allegedly caused by the Corps of Engineers' Starved Rock Dam on the Illinois River. There have been only minor repairs made over the years and recent surveys have indicated that the project is in poor condition and is potentially dangerous. A major buttress footing has been u dercut along with other buttresses and wingwal However, in the event of sudden dam failure, lit damage is anticipated because of the undevelop nature of areas below the dam and small volume water behind the dam. Redevelopment of the s is considered unwarranted and repairs on t structure are estimated at $160,000. Thus futu operation of the Dayton project appears to financially questionable. This report does come to conclusions about the disposition of t Dayton project, but provides information for t Federal Power Commission and its staff to co sider that disposition. (Smith-North Carolina)
W77-01511

6G. Ecologic Impact Of Water Development

A TECHNIQUE FOR PREDICTING TH AQUATIC ECOSYSTEM RESPONSE T WEATHER MODIFICATION,
Utah Center for Water Resources Researc Logan.
For primary bibliographic entry see Field 3B.
W77-01051

RESEARCH TO DEVELOP ECOLOGIC STANDARDS FOR WATER RESOURCES,
Oklahoma Univ., Norman. Bureau of Water a Environmental Resources Research.
George W. Reid.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-260 4 Price codes: A14 in paper copy, A01 in microfic Completion Report, July 1976. 304 p, 35 fig, 60 t 115 ref, 6 append. OWRT B-032-OKLA(1). 14-0001-5132.

Descriptors: *Planning, *Water resour development, *Evaluation, *Standards, Ecolo *Ecosystems, *Environment, Social impa *Oklahoma, Methodology, River basin devel ment, Biota.
Identifiers: *Mid-Arkansas River Basin(Ok *Ecological standards.

This study attempts to develop ecological st dards to assist in the evaluation of water resour development. The standards developed meaningful for and applicable to all the aqua land and land-water interface environments. T steps were undertaken to establish ecological st dards. The first one is the categorization development levels of natural environment measuring specific socio-economic factors wh are capable of delineating the human modificat of the ecological system. The second one is development of the ecological standards response to various development levels so as reflect the human influence on the ecolog system. A unique and significant feature of project is the combination of both socio-econo and environmental considerations in the eval tion of the ecological system. The validation of methodology is accomplished by using data fr the Mid-Arkansas River Basin.
W77-01054

RECENT DEVELOPMENTS IN THE LAW THE SEA: A SYNOPSIS,
For primary bibliographic entry see Field 6E.
W77-01075

JARVIS V STATE LAND DEPARTMENT (U OF WATER OUT OF CRITICAL GROUN WATER IN AMOUNT EQUAL TO ANNU HISTORICAL MAXIMUM USE).
550 P2d 227-30 (Ariz 1976). 4 p.

Descriptors: *Arizona, *Water supply devel ment, *Water shortage, *Water policy, *Water porting, Water delivery, Water conveyance, Le

view, Judicial decisions, Water demand, Water
nagement(Applied), Water distribu-
n(Applied), Water conservation, Pumping,
ells.
entifiers: *Injunctive relief.

aintiff city sought modification of a permanent
unction which had been obtained by the defen-
nt on behalf of himself and others who cul-
ated land in a critical water area. The injunction
ohibited the city from pumping water out of the
tical water area for transport and use in the city.
review the enjoining court held that if the city
rchased land within the critical water area it
uld use the water formerly used for growi ng
ops thereon. This the city had done; now it
ught to modify the injunction to allow pumping
begin. The defendant contended that the injunc-
n did not allow the city to pump out the greatest
nount of water used in any year on the parcel
rchased, but only to pump out an average of the
nual maximum amount of water used on the par-
l retired from utilization. The Arizona Supreme
urt accepted defendant's argument and in-
preted the injunction's use of the word
storical' as requiring the word 'maximum' to be
stricted to an average of the annual maximum
nount of water previously used on the parcel
rchased. (Welch-Florida)
77-01111

**VALUATING ENVIRONMENTAL QUALITY
ANAGEMENT PROGRAMMES IN WHICH
SCHARGERS ARE GROUPED,**
inois Univ. at Urbana-Champaign. Dept. of Civil
ngineering.
r primary bibliographic entry see Field 5G.
77-01170

**COSYSTEM MODELS AND ENVIRONMEN-
AL POLICY,**
n Diego State Univ., Calif. Center for Regional
nvironmental Studies.
F. Cooper.
mulation, Vol. 26, No. 5, p 133-138, May 1976.
ref.

escriptors: *Ecosystems, *Environment,
Mathematical models, Simulation analysis, Deci-
n making, Management, Planning, Systems
alysis, Model studies.
entifiers: *Environmental quality.

e use of models for guiding environmental pol-
should be distinguished from their use in imple-
enting management policies already decided
on. Ecosystem models are of potentially great
lue for guiding and informing incremental deci-
ons regarding environmental policy. They are un-
ely to be used as a basis for comprehensive
structuring of programs. Their greatest use may
in identifying points of leverage, where incre-
ental policy changes will have the greatest long-
m beneficial impact. For this reason, provision
r formal sensitivity analysis is essential in
odels used to guide environmental policy.
ological models are more likely to influence pol-
decisions if they incorporate features which
ould be a part of any good model but which are
ten skimped-upon: adequate documentation;
asonableness of prediction; explanation of limits
d probable range of error; flexibility to deal with
anticipated problems; and effective presenta-
n and display. (Bell-Cornell)
77-01172

**HE SAINT JOHN RIVER SYSTEM MODELS:
CASE STUDY,**
epartment of the Environment, Ottawa
ntario). Ecological Systems Research Div.
r primary bibliographic entry see Field 5G.
77-01178

DRAFT ENVIRONMENTAL STATEMENT: PROJECT SKYWATER A PROGRAM OF RESEARCH IN PRECIPITATION MANAGEMENT, VOLUME I OF II.
Bureau of Reclamation, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 113, Price codes: A14 in paper copy, A01 in microfiche. 1976. 220 p, 36 fig, 37 tab.

Descriptors: *Environmental effects, *Cloud seeding, *Weather modification, *Water resources development, Artificial precipitation, Weather, Water management(Applied), Water resources, Technology, Research and development, Rocky Mountain region, Pacific Coast region, Agriculture, Silver iodide, On-site investigations, Erosion, Avalanches, Snowpacks, Federal government, Snow, Water yield improvement.
Identifiers: *EIS, *Project Skywater.

The Department of the Interior has filed a draft environmental statement on its research effort in developing the technology of cloud seeding. The Department hopes that cloud seeding will be come a useful water resources management tool. Most of the studies have been conducted in the Western states, an area which includes a subtropical climate along the Pacific Coast, a vast, arid region in New Mexico and Arizona and the high, weather-making Rocky Mountains. The environmental impact of the project is expected to be minimal with only insignificant increases in plant growth and streamflow. With development of a successful technology, significant increases in plant growth and streamflow would be expected. Other than a probable increase in the incidence of avalanches, no significant adverse impacts have been identified. Project alternatives include such methods of increasing water resources as desalinization, exploitation of groundwater resources, recycling of water, and land management for increased water yield. Resources consumed by the project include cloud seeding chemicals, airplane fuel, and electrical energy. (Capehart-Florida)
W77-01187

ARE HOVERCRAFT A MAJOR CAUSE OF DISTURBANCES TO INERTIDAL INVERTEBRATES,
Institute of Terrestrial Ecology, Norwich (England). Colney Research Station.
S. A. McGorty, Jenyon, and R. Le B. Williams.
Biological Conservation, Vol. 9, No. 7, p. 13-20, 1976, 3 fig., 3 tab., 3 ref.

Descriptors: *Environmental effects, *Invertebrates, *Habitats, *Intertidal areas, *Sands, *Particle size, *Food chains, Populations, Analytical techniques, On-Site Data Collections.
Identifiers: *Hovercraft, Nereis spp., Arenicola spp., Spionid spp.

The densities of intertidal invertebrates in areas within and outside a hovercraft flightpath were compared by analysis of variance and least significant range tests. No evidence was found to suggest that the hovercraft had significantly reduced the density of invertebrates in the flightpath area. Only five species groups (Nereis diversicolor, Spionid spp., Bathyporeia spp., Macoma balthica, and Arenicola marina) had significantly different densities between areas, and in each case there was a density gradient alongshore. In three species groups (Spionid spp., Bathyporeia, spp., and Macoma balthica) density was related to the percentage of fine sand at each site. (Katz)
W77-01263

COOPERATIVE CONTROL OF INTERNATIONAL POLLUTION AND COMMON PROPERTY RESOURCES,
University of Western Ontario, London.
For primary bibliographic entry see Field 5G.
W77-01290

ENVIRONMENTAL DATA MANAGEMENT,
G. K. Young, and G. F. Tierney.
Journal of the Water Resources Planning and Management Division, Vol. 102, No. WR2, Proceedings of the American Society of Civil Engineers, p 255-264, November 1976. 5 fig.

Descriptors: *Computer models, *Data processing, *Statistical methods, Water quality, Environmental engineering, Standards, Forecasting, Systems analysis, Simulation analysis.
Identifiers: *Environmental quality, *Information systems, *Data management, Error, Cost distribution, Protocol, Data.

A holistic viewpoint is taken of basic data needs to support environmental forecasting, modeling, and decision making. A protocol is suggested which places forecast errors in a key role. Data bases should be reviewed and their error properties analyzed with respect to forecasting precision. Data programs should be oriented to minimizing forecast variance within cost and overall program needs constraints. Recognized big issues concern the: (1) Need for a rational data assessment protocal; (2) difficulty of generalizing requirements; (3) fact that simulation models have outdistanced the availability of data to support them; (4) observation that agency programs apparently place too much stress on analysis and not enough on data gathering activities; and (5) chronic problem that water quatity and quality data collection needs to be coordinated. (Bell-Cornell)
W77-01347

POLLUTION, MAN, HIS ENVIRONMENT AND THE PHYSICIST, (BESOEDELING, DIE MENS, SY OMGEWING EN DIE FISIKUS),
For primary bibliographic entry see Field 5G.
W77-01482

ARTIFICIAL ISLANDS: INFORMATION NEEDS AND IMPACT CRITERIA,
Delaware Univ., Lewes. Marine Studies Center.
L. Watling.
Marine Pollution Bulletin, Vol. 6, No. 9, p. 139-141, September, 1975. 3 ref.

Descriptors: *Environmental effects, *Reviews, Water quality, Structures, *Salinity, *Temperature, *Turbidity, Technology, *Light penetration, *Water pollution effects, Water quality control, Marine animals, Benthos, Sediments.
Identifiers: *Artificial Islands, *Environmental impact.

This is a review of the information needed before realistic forecasts can be made of the effects of new developments on the marine environment. The review resulted from the need to assess the impact of an artifical island off the east coast of the United States. Manmade structures in the sea, ranging from oil platforms to large anchored floating structures and reclaimed land in shallower water, are proliferating around the world with more forseen in the future. It will be important to forecast the effect they have on the surrounding sea areas and marine resources as accurately as possible. (Katz)
W77-01501

ENVIRONMENTAL POISONS.
For primary bibliographic entry see Field 5C.
W77-01547

7. RESOURCES DATA

7B. Data Acquisition

THE MEASUREMENT OF WATER LOSSES FROM A FORESTED AREA USING A 'NATURAL' LYSIMETER,
Institute of Hydrology, Wallingford (England).

For primary bibliographic entry see Field 2D.
W77-01148

IFYGL RAWINSONDE DATA ACQUISITION SYSTEM,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-01189

METHOD FOR FINDING TEMPERATURE ENVIRONMENTS FOR FISH,
G. Peterson.
U. S. Patent No. 3,968,586, 10 p, 8 fig, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 948, No 2, p 440, July 13, 1976.

Descriptors: *Patents, *Water measurement, *Temperature, *Thermocline, *Environmental gradient, Depth, Fish, Fish populations, Fishing, Environments, Habitats, Instrumentation.

This invention relates to a method of prospecting for fish in lakes and oceans, and more particularly to water differential temperature measurement for use in conjunction with boats for the express purpose of locating suitable or likely environments for specific varieties of fish. Since fish have preferred temperatures, they will seek these temperatures in lakes and oceans if they can be found and will usually stay in those regions where the preferred temperatures prevail. Fishing boats are equipped with an apparatus whereby temperature measurements can be taken at, or near the surface of a large body of water. The apparatus is comprised of a highly sensitive differential temperature measuring means such as a pair of thermistor-type probes which are connected to opposite arms of a highly sensitive wheatstone bridge curcuit. On the the thermistors is easily interchangeable with a variable standard resistor thereby providing the capability of taking direct temperature measurements. The method consists of locating the specific varieties of fish by making a series of passes with the boat, making differential temperature measurements just beneath the surface of the water, plotting differential temperature measurements on the chart and comparing the chart with known temperature environments suitable for certain types of fish. (Sinha-OEIS)
W77-01212

OCEANOGRAPHIC APPARATUS,
General Dynamics Corp., St. Louis, Mo. (Assignee).
For primary bibliographic entry see Field 2L.
W77-01214

IN-SITU OCEANOGRAPHIC SAMPLE SEPARATOR,
Office of the Secretary (Navy), Washington, D.C.
For primary bibliographic entry see Field 2L.
W77-01223

DYNAMICALLY BALANCED APPARATUS FOR WATER BORNE INSTRUMENTS,
S. J. Niskin.
U.S. Patent No. 3,971,251, 9 p, 9 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 948, No 4, p 1353, July 27, 1976.

Descriptors: *Patents, *Instrumentation, *Water measurement, *Currents(Water), *Flow measurement, Current meters, Waves(Water).
Identifiers: Instrument housing.

When measuring the flow of water for direction and velocity instruments must be maintained in a horizontal position and facing the direction of flow of water. However, in the event the current is very fast or the water becomes rough with high and violent wave actions, the float and cable to which the instruments are attached will cause the latter to rise and fall and oscillate or vibrate out of their proper position so that inaccurate results are obtained. This invention provides water borne instruments with a housing that is dynamically balanced whereby the instruments are maintained in the current of the body of water in a predetermined and optimum position for the operation of the instruments. The housing is supported by a cable anchored at one end and having a float at the other end, the housing being pivotally suspended from a stand-off which is rotatably secured to the cable to prevent entanglement of the housing with the cable. The housing is supported at its mid-portion with arms extending horizontally. The meters are mounted on each of the arm portions facing in the direction from which the water flows. The housing maintains this position with rudders or vanes which have a dampening effect on forces attempting to swing the housing out of alignment with the current flow. (Sinha-OEIS)
W77-01232

THE INTERPRETATION OF RAINFALL PATTERNS IN NORTHERN YUCATAN UTILIZING METEOROLOGICAL SATELLITE IMAGERY,
University of South Alabama, Mobile.
For primary bibliographic entry see Field 2B.
W77-01280

MEASURING HYDROLOGIC PROPERTIES OF SOIL WITH A DOUBLE-RING INFILTROMETER AND MULTIPLE-DEPTH TENSIOMETERS,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 2G.
W77-01325

EVAPORATION MEASUREMENTS WITH A SELF-RECORDING EVAPORIGRAPH,
Meteorological Office, Poona (India).
For primary bibliographic entry see Field 2D.
W77-01331

AN EVAPORATION EQUATION FOR AN OPEN BODY OF WATER EXPOSED TO THE ATMOSPHERE,
Auburn Univ., Ala. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2D.
W77-01338

LEAF DIFFUSION RESISTANCE TO WATER VAPOUR AND ITS DIRECT MEASUREMENT,
Agricultural Univ., Wageningen (Netherlands). Lab. of Physiological Meteorology.
For primary bibliographic entry see Field 2D.
W77-01378

A RECORDING SOIL MOISTURE TENSIOMETER,
Forest Service (USDA), Portland, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W77-01429

SNOWMELT LYSIMETERS PERFORM WELL IN COLD TEMPERATURES IN CENTRAL COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W77-01432

PROSPECTS OF HYDROMETRY IN THE LIGHT OF MODERN TECHNOLOGY,
International Commission on Irrigation and Drainage, New Delhi (India).
K. K. Framji.
International Commission on Irrigation and Drainage Bulletin, p 20-28, January 1975. 44 ref.

Descriptors: *Hydrometry, *Measurement, Technology, Water quality, Water quality control, Water measurement, Irrigation, Instrumentation.

The prospects from the use of modern technology that is, the application of modern sciences and the use of modern tools and materials are clearly bright for the development of precise methods and instruments of hydrometry. Sciences and technologies, such as computer-science electronics, ultrasonic and telemetry, the use of light weight plastics and special non-ferrous alloys, the application of specially-designed hydrometric ships and aluminium and fiberglass boats, all point to future prospects of achieving high degrees of precision and uniformity in measurements. Also in the not too distant future the use of space craft and earth satellites for automatic transmission of automatically observed data is no longer in the realm of fantasy. The sky is the limit. (Skogerboe-Colo St)
W77-01519

DESIGN AND PRELIMINARY EVALUATION OF AN IMPROVED ARTIFICIAL SUBSTRATE SAMPLER FOR AQUATIC MACROINVERTEBRATES,
Texas Instruments, Inc., Northfield, Mass. Ecology Service Group.
M. D. McDaniel.
Prog Fish-Cult. 36(1), p 23-25, 1974.

Descriptors: *Invertebrates, Sampling, Benthos, *Analytical techniques, Monitoring, Design.

A number of artificial substrate devices have been developed to circumvent obstacles encountered in conventional benthic sampling for macroinvertebrates. These devices, at best, are only semi quantitative, yet they provide freedom in selection of sampling site and homogeneity of substrate type and area. Their use can result in samples with good potential for comparisons within and among various aquatic ecosystems. An improved artificial substrate sampler has been developed that combines the features of a multiple-plate sampler with a synthetic webbing material. The new sampler is inexpensive, easily portable; and may be processed in the field and returned to the water or returned to the lab for processing. It is an effective sampling method in both lotic and lentic environments and that is possesses great potential for biological water quality monitoring.—Copyright 1975, Biological Abstracts, Inc.
W77-01530

7C. Evaluation, Processing and Publication

A REVISED REGIONAL FREQUENCY CURVE FOR THE YARRA CATCHMENT ABOVE WARRANDYTE (AUSTRALIA).
Melbourne and Metropolitan Board of Works (Australia), Water supply, Sewerage and Drainage Branch.
For primary bibliographic entry see Field 4A.
W77-01068

FUTURE DIRECTION OF URBAN WATER MODELS,
Water Resources Engineers, Inc. Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W77-01071

COMPRESSION OF TIME-SERIES DATA,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
R. P. Ibbitt.
Journal of Hydrology (New Zealand), Vol. 14, No 1, p 30-41, 1975. 2 fig, 4 tab, 2 ref, 2 append.

scriptors: *Data processing, *Water levels, ata storage and retrieval, *Computers, Regres- n analysis, Rating curves, Streamflow, Stream ges, Analytical techniques, Information rieval, Equations.
ntifiers: *Data compression, Interpolating, ne-series data.

hen water level data are stored on a computer, amount of storage space needed can be duced by eliminating data that can be provided proximately by linear interpolation. Benefits m reduced computer time are also obtained ce fewer values have to be retrieved from the . The aim of the compression process is to filter small and abrupt water level fluctuations hout affecting the information content of the ord. To avoid over-compressing the data, it is irable to have some method by which an upper it on the 'compression range' can be deter- ned. A method was presented by which this it can be obtained under different assumptions out the accuracy of a rating curve. (Sims-ISWS) 7-01132

ATHEMATICAL ANALYSIS OF THE CHEMI- L SYSTEM 'CYANIDE-HEAVY METALS' IN ATER-DETERMINATION OF COMPONENTS D TOXICITY OF THE SYSTEM-II, SOLU- ON BY COMPUTER,
te Textile Research Inst., Brno zechoslovakia). Center for Research and Appli- ion Ionized Radiation.
r primary bibliographic entry see Field 5B. 7-01260

SOURCE INVENTORY MANAGEMENT ANNING SYSTEM (RIMPS). USER MANUAL,
dan (Edward C.), Inc., Portland, Maine.
r primary bibliographic entry see Field 5G. 7-01294

SIMPLE COMPUTER PROGRAM FOR THE TERMINATION OF AQUIFER CHARAC- RISTICS FROM PUMP TEST DATA,
uthwest Florida Water Management District, ooksville.
C. Holzschuh, III.
ound Water, Vol. 14, No. 5, p 283-285, Sep- mber-October 1976. 3 fig, 1 tab, 2 ref.

scriptors: *Computer programs, *Data ocessing, *Aquifer characteristics, *Pump test- , Estimating, Analytical techniques, Graphical thods, Graphical analysis, Leakage, Transmis- ity, Storage coefficient, Hydraulic conductivi-
ntifiers: *Hantush inflection point method, sk calculators, Turnaround time, Leakance.

omputer program, based on the Hantush inflec- n method and designed for 'desk top' computers s presented. The method assumed a leaky, tropic, homogeneous aquifer of infinite areal ent. The language employed was BASIC, and eractive language used on the Wang Model 2200 grammable calculator. The program can be ily adapted to FORTRAN IV for use on larger chines. (Visocky-ISWS) 7-01337

VIRONMENTAL DATA MANAGEMENT,
primary bibliographic entry see Field 6G. 7-01347

TON DAM FLOOD OF JUNE 1976, MORE- ND QUADRANGLE, IDAHO,
logical Survey, Boise, Idaho.
.. Hubbard, and J. H. Bartells.
ilable from Branch of Distribution, USGS, 0 S. Eads St., Arlington, Va. 22202, price $1.75.
drologic Investigations Atlas HA-580, 1976. 1 et, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The aea covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Moreland quadrangle. (Woodard-USGS)
W77-01395

TETON DAM FLOOD OF JUNE 1976, FIRTH QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
L. L. Hubbard, and J. H. Bartells.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-577, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Firth quadrangle. (Woodard-USGS)
W77-01396

TETON DAM FLOOD OF JUNE 1976, ROSE QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
J. H. Bartells, and L. L. Hubbard.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-578, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Rose quadrangle. (Woodard-USGS)
W77-01397

TETON DAM FLOOD OF JUNE 1976, MENAN BUTTES QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
C. A. Thomas, H. A. Ray, and W. A. Harenberg.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-570, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Menan Buttes quadrangle. (Woodard-USGS)
W77-01398

TETON DAM FLOOD OF JUNE 1976, NEWDALE QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
H. A. Ray, H. F. Matthai, and C. A. Thomas.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-565, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small iso-

lated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Newdale quadrangle. (Woodard-USGS)
W77-01399

TETON DAM FLOOD OF JUNE 1976, PARKER QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
C. A. Thomas, and H. A. Ray.
Available from Branch of Distribution, USGS, 1200 Eads St., Arlington, Va 22202, price $1.75. Hydrologic Investigations Atlas HA-567, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls, Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Parker quadrangle. (Woodard-USGS)
W77-01400

TETON DAM FLOOD OF JUNE 1976, BLACKFOOT QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
J. H. Bartells, and L. L. Hubbard.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-579, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Blackfoot quadrangle. (Woodard-USGS)
W77-01401

TETON DAM FLOOD OF JUNE 1976, PINGREE QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
L. L. Hubbard, and J. H. Bartells.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-581, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Pingree quadrangle. (Woodard-USGS)
W77-01402

TETON DAM FLOOD OF JUNE 1976, MOODY QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
W. A. Harenberg, and B. B. Bigelow.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-568, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Moody quadrangle. (Woodard-USGS)
W77-01403

TETON DAM FLOOD OF JUNE 1976, REXBURG QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
W. A. Harenberg, and B. B. Bigelow.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-569, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho *Flood profiles, *Maps, Runoff, Water levels Elevation, High water mark, Contours, Aeria photography.
Identifiers: *Teton Dam(Idaho), *Snake River, In undated area.

The failure of the Teton Dam caused extrem flooding along the Teton River, Henrys Fork, an Snake River in southeastern Idaho on June 5-8 1976. No flooding occurred downstream fro American Falls Reservoir. The inundated area and maximum water-surface elevations are show in a series of 17 hydrologic atlases. The are covered by the atlases extends from Teton Da downstream to American Falls Reservoir, distance of 100 miles. The extent of floodin shown on the maps was obtained by field inspec tions and aerial photographs made during and im mediately after the flood. There may be small iso lated areas within the boundaries shown that wer not flooded, but the identification on these site was beyond the scope of the study. The elevatio data shown are mean-sea-level elevations of high water marks identified in the field. This particula map (in the 17-map series) shows conditions in th Rexburg quadrangle. (Woodard-USGS)
W77-01404

TETON DAM FLOOD OF JUNE 1976, RIGB QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
H. A. Ray, and B. B. Bigelow.
Available from Branch of Distribution, USGS 1200 S. Eads St., Arlington, Va. 22202, price $1.7 Hydrologic Investigations Atlas HA-572, 1976. sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idah *Flood profiles, *Maps, Runoff, Water level Elevation, High water marks, Contours, Aer photography.
Identifiers: *Teton Dam(Idaho), *Snake River, I undated area.

The failure of the Teton Dam caused extre flooding along the Teton River, Henrys Fork, a Snake River in southeastern Idaho on June 5- 1976. No flooding occurred downstream fro American Falls Reservoir. The inundated are and maximum water-surface elevations are show in a series of 17 hydrologic atlases. The ar covered by the atlases extends from Teton Da downstream to American Falls Reservoir, distance of 100 miles. The extent of floodi shown on the maps was obtained by field inspe tions and aerial photographs made during and i mediately after the flood. There may be small is lated areas within the boundaries shown that we not flooded, but the identification of these si was beyond the scope of the study. The elevati data shown are mean-sea-level elevations of hig water marks identified in the field. This particul map (in the 17-map series) shows conditions in t Rigby quadrangle. (Woodard-USGS)
W77-01405

TETON DAM FLOOD OF JUNE 197 LEWISVILLE QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
H. A. Ray, and B. B. Bigelow.
Available from Branch of Distribution, USG 1200 S. Eads St., Arlington, Va. 22202, price $1. Hydrologic Investigations Atlas HA-573, 1976 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idah *Flood profiles, *Maps, Runoff, Water leve Elevation, High water mark, Contours, Aer photography.
Identifiers: *Teton Dam(Idaho), *Snake River, undated area.

The failure of the Teton Dam caused extre flooding along the Teton River, Henrys Fork, a Snake River in southeastern Idaho on June 5

976. No flooding occurred downstream from merican Falls Reservoir. The inundated areas nd maximum water-surface elevations are shown a series of 17 hydrologic atlases. The area vered by the atlases extends from Teton Dam wnstream to American Falls Reservoir, a stance of 100 miles. The extent of flooding own on the maps was obtained by field inspec-ns and aerial photographs made during and im-ediately after the flood. There may be small iso-ted areas within the boundaries shown that were t flooded, but the identification of these sites as beyond the scope of the study. The elevation ta shown are mean-sea-level elevations of high-ater marks identified in the field. This particular ap (in the 17-map series) shows conditions in the ewisville quadrangle. (Woodard-USGS)
W77-01406

ETON DAM FLOOD OF JUNE 1976, WOOD-LLE QUADRANGLE, IDAHO,
eological Survey, Boise, Idaho.
F. Matthai, and H. A. Ray.
vailable from Branch of Distribution, USGS, 00 S. Eads St., Arlington, Va. 22202, price $1.75. ydrologic Investigations Atlas HA-576, 1976. 1 eet, 1 map.

escriptors: *Dam failure, *Floods, *Idaho, lood profiles, *Maps, Runoff, Water levels, evation, High water mark, Contours, Aerial otography.
entifiers: *Teton Dam(Idaho), *Snake River, In-dated area.

he failure of the Teton Dam caused extreme ooding along the Teton River, Henrys Fork, and ake River in southeastern Idaho on June 5-8, 76. No flooding occurred downstream from nerican Falls Reservoir. The inundated areas d maximum water-surface elevations are shown a series of 17 hydrologic atlases. The area vered by the atlases extends from Teton Dam wnstream to American Falls Reservoir, a stance of 100 miles. The extent of flooding own on the maps was obtained by field inspec-ns and aerial photographs made during and im-ediately after the flood. There may be small iso-ed areas within the boundaries shown that were t flooded, but the identification of these sites s beyond the scope of the study. The elevation ta shown are mean-sea-level elevations of high-ater marks identified in the field. This particular ap (in the 17-map series) shows conditions in the oodville quadrangle. (Woodard-USGS)
W77-01407

ETON DAM FLOOD OF JUNE 1976, ST. NTHONY QUADRANGLE, IDAHO,
ological Survey, Boise, Idaho.
A. Thomas, H. A. Ray, and H. F. Matthai.
ailable from Branch of Distribution, USGS, 00 S. Eads St., Arlington, Va. 22202, price $1.75. drologic Investigations Atlas HA-566, 1976. 1 eet, 1 map.

scriptors: *Dam failure, *Floods, *Idaho, lood profiles, *Maps, Runoff, Waer levels, El-tion, High water mark, Contours, Aerial photog-phy.
ntifiers: *Teton Dam(Idaho), *Snake River, In-dated area.

e failure of the Teton Dam caused extreme oding along the Teton River, Henrys Fork, and ake River in southeastern Idaho on June 5-8, 76. No flooding occurred downstream from nerican Falls Reservoir. The inundated areas d maximum water-surface elevations are shown a series of 17 hydrologic atlases. The area vered by the atlases extends from Teton Dam wnstream to American Falls Reservoir, a tance of 100 miles. The extent of flooding own on the maps was obtained by field inspec-ns and aerial photographs made during and im-diately after the flood. There may be small iso-lated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the St. Anthony quadrangle. (Woodard-USGS)
W77-01408

TETON DAM FLOOD OF JUNE 1976, DEER PARKS QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
H. A. Ray, C. M. Bennett, and A. W. Records.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-571, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Deer Parks quadrangle. (Woodard-USGS)
W77-01409

TETON DAM FLOOD OF JUNE 1976, IDAHO FALLS SOUTH QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
H. A. Ray, and H. F. Matthai.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-575, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profiles, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Idaho Falls South quadrangle. (Woodard-USGS)
W77-01410

TETON DAM FLOOD OF JUNE 1976, IDAHO FALLS NORTH QUADRANGLE, IDAHO,
Geological Survey, Boise, Idaho.
H. A. Ray, and H. F. Matthai.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va. 22202, price $1.75. Hydrologic Investigations Atlas HA-574, 1976. 1 sheet, 1 map.

Descriptors: *Dam failure, *Floods, *Idaho, *Flood profile, *Maps, Runoff, Water levels, Elevation, High water mark, Contours, Aerial photography.
Identifiers: *Teton Dam(Idaho), *Snake River, Inundated area.

The failure of the Teton Dam caused extreme flooding along the Teton River, Henrys Fork, and Snake River in southeastern Idaho on June 5-8, 1976. No flooding occurred downstream from American Falls Reservoir. The inundated areas and maximum water-surface elevations are shown in a series of 17 hydrologic atlases. The area covered by the atlases extends from Teton Dam downstream to American Falls Reservoir, a distance of 100 miles. The extent of flooding shown on the maps was obtained by field inspections and aerial photographs made during and immediately after the flood. There may be small isolated areas within the boundaries shown that were not flooded, but the identification of these sites was beyond the scope of the study. The elevation data shown are mean-sea-level elevations of high-water marks identified in the field. This particular map (in the 17-map series) shows conditions in the Idaho Falls North quadrangle. (Woodard-USGS)
W77-01411

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN--VOLUME 1. OHIO RIVER BASIN ABOVE KANAWHA RIVER.
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Wash., D.C. 20402, price $5.45. Water-Supply Paper 2107, 1976. 668 p, 1 fig.

Descriptors: *Hydrologic data, *Surface water, *Streamflow, *Lakes, *Ohio River, River basins, Maryland, New York, Ohio, Pennsylvania, West Virginia, Basic data collections, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow, Reservoir stages.
Identifiers: *Ohio River basin, Maximum discharges, Minimum discharges.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Ohio River basin above Kanawha River. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W77-01412

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS.
Geological Survey, Reston, Va.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va 22202, price $5.85. Geological Survey Water-Supply Paper 2131, 1976. 747 p, 9 fig.

Descriptors: *Hydrologic data, *Surface waters, *Streamflow, *Lakes, *California, Basic data col-

lections, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Average flow, Reservoir, Reservoir stages.
Identifiers: *Pacific slope basins(Calif), Northern Central Valley, Maximum discharges, Minimum discharges, Reservoir content.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Pacific slope basins in California, Northern Central Valley. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. Data for partial record station are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. For most gaging stations on lakes and reservoirs the data comprise a descsription of the station and a monthly summary table of stage and contents. For some reservoirs a table showing daily contents or stage is given. (Woodard-USGS)
W77-01413

LIMNOLOGICAL DATA REPORT FOR THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION--U. S. GEOLOGICAL SURVEY COOPERATIVE LAKE STUDIES PROJECT,
Geological Survey, Augusta, Maine.
For primary bibliographic entry see Field 2H.
W77-01414

GROUND-WATER DATA FOR THE SANTA MARIA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W77-01415

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1971-SEPTEMBER 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W77-01416

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
C. E. Ranzau, Jr.
Open-file report, June 1976. 228 p, 16 fig, 14 tab, 4 ref.

Descriptors: *Hydrologic data, *Urban hydrology, *Water quality, *Streamflow, *Reservoir storage, Texas, Rainfall-runoff relationships, Urban runoff, Gaging stations, Flow rates, Chemical analysis.
Identifiers: *Houston(Tex).

Basic hydrologic data collected in the Houston urban area for the 1974 water year (October 1973 to September 1974) are presented. Precipitation data are based on 29 recording rain gages in the Houston metropolitan area. Rainfall for the year was unevenly distributed over the area. Individual station totals ranged from 32.8 inches at the Old Richmond Road rain gage to 61.8 inches at the Llano Street rain gage. The 30-year average (1941-70 is 48.19 inches at the Houston Intercontinental Airport rain gage. The only area-wide storm selected for analysis was the storm of January 19. runoff data are based on discharge measurements and stage records at 19 continuous-record stream-gaging stations, 6 partial-record stream-gaging stations, and 2 reservoir-content stations. A tabulation of water-quality data is included for 19 sites. (Woodard-USGS)
W77-01419

SIMULATION OF EVAPOTRANSPIRATION AND DRAINAGE FROM MATURE AND CLEAR-CUT DECIDUOUS FORESTS AND YOUNG PINE PLANTATION,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 2D.
W77-01424

SYSTEM ANALYSIS: SPRINKLER SPACING, (SISTEEMANALISE: SPRINKELAAR-SPASIERING),
South Africa Dept. of Agricultural Technical Services, Pretoria.
For primary bibliographic entry see Field 3F.
W77-01453

COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES, VOL. III, ANNOTATED BIBLIOGRAPHY OF STATE DATA AND INFORMATION SOURCES,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 5A.
W77-01494

8. ENGINEERING WORKS

8A. Structures

SUGARLOAF CREEK PROJECT (AUSTRALIA): FLOOD STUDIES.
Melbourne and Metropolitan Board of Works (Australia). Water Supply Div.
Report No. MMBW-W-0053, December 1975. 7 p., 12 fig., 3 tables, 3 ref., 2 append.

Descriptors: *Design data, *Reservoir design, *Australia, Unit hydrographs, Inflow, Probable maximum precipitation, Rainfall-runoff relationships, Frequency curves, Duration curves, Rainfall intensity, Small watersheds, *Water supply.
Identifiers: *Sugarloaf Creek Reservoir(Vic), *Yarra River(Vic), *Melbourne(Vic).

The Sugarloaf Creek Reservoir is planned to provide additional storage for metropolitan water supply to Melbourne (Victoria, Australia) by pumping water from the Yarra River during periods of excess flow. The Clark-Johnstone synthetic unitgraph procedure is used to derive the inflow hydrograph resulting from an estimated maximum probable precipitation over the reservoir catchment, and intensity-frequency-duration curves for return periods ranging from one to a thousand years are presented. (CSIRO)
W77-01067

CAUGHT IN MID-STREAM: ARMY CORPS OF ENGINEERS,
For primary bibliographic entry see Field 6E.
W77-01086

FEDERAL MANPOWER IN WATER RESOURCE ENGINEERING,
Bureau of Reclamation, Denver Colo.
For primary bibliographic entry see Field 6B.
W77-01342

THOR ACROSS THE LIMPOPO.
Construction in Southern Africa, Vol 20 (6), p 63-39, (1975). 3 fig, 3 tab.

Descriptors: *Water demand, Dam design, Geologic investigations, Barrages, Irrigation, *Water supply, Africa.
Identifiers: *Limpopo River, South Africa, Rhodesia, Thor Dam.

The critical situation with water supplies around Beit Bridge (which is the border post between Rhodesia and the Republic of South Africa) has last, after many years of discussion, led to a pr ject to dam the Limpopo River. Rhodesia w going to participate, but has now dropped out. T project will, however, carry on and the Thor Da will now become a reality. The author gives deta of the water requirements that led to the decisi to construct the dam, as well as full particulars the expected growth rate, demand on the propos dam, the geology of the site, and the specificatio of the dam. (South Africa)
W77-01369

A MATTER OF HYDRAULICS AT STEENBRA
For primary bibliographic entry see Field 8C.
W77-01370

ORANGE RIVER PROJECT, RIVER DIVE SION AT P K LE ROUX DAM,
C. A. Carter.
The Civil Engineer in South Africa, Vol. 16 (9) 300-301, (1974).

Descriptors: Cofferdams, Probability, Flo damage, Flood control, Africa, Damsites, D design, Flood forecasting.
Identifiers: *South Africa, Orange River, P K Roux Dam, Orange River project.

A description is presented of the design and p formance of the river diversion system at the P le Roux Dam site to hold at bay the waters of Orange River during the construction of the d It was decided to dispense with concrete cof dams, to construct earth embankments and operate the Hendrik Verwoerd Dam upstream such a way as to provide a volume in the reserv for flood storage. Two floods in one wet seas both topping the 1 in 40 years probability occurr during the one vulnerable flood season of c struction are described. (South Africa)
W77-01372

EXPLORING THE DRAKENSBERG.
For primary bibliographic entry see Field 4A.
W77-01373

SOUTH AFRICA'S OWN SNOWY MOUNT SCHEME,
For primary bibliographic entry see Field 8C.
W77-01374

R10 MILLION WATER SCHEME NE COMPLETION, IRRIGATING THE ISLA OF THE ORANGE.
For primary bibliographic entry see Field 3F.
W77-01375

HARNESSING THE CUNENE'S MIGHT.
For primary bibliographic entry see Field 8C.
W77-01376

THE ORANGE-FISH TUNNEL - THE LONG AQUEDUCT IN THE SOUTHERN HE SPHERE (DIE ORANJE-VISTONNEL LANGSTE AKWADUK IN SUIDELIKE H FROND).
The Civil Engineer in South Africa, Vol 17 (148-150, (1975).

Descriptors: Tunneling, Tunnel linings, Tu design, Ventilation, Diversion structures, I basin transfers.
Identifiers: South Africa, Verwoerd D *Orange River project, Fish River, Theebus R

Describes the construction of the 82 km Orange-Fish tunnel which diverts the waters o Orange River at Oviston on the Verwoerd Da the Theebus River one of the tributaries of Fish River which flows into the Indian Ocean

ort Elizabeth. Full details are given of the ex-avations, ventilation shafts, concreting and roblems experienced with water and methane as. All the important statistics of the construction ork are tabulated. (South Africa)
V77-01384

SANITARY ENGINEER'S VIEWPOINT ON HE DESIGN, INSTALLATION, MAIN-ENANCE AND COST OF SANITARY RAINAGE SYSTEMS IN HIGH-RISE UILDINGS,
. T. Murray.
lunicipal Engineer, Vol 5 (6), p 51-59, (1974).

escriptors: *Buildings, *Drainage systems, ewerage, *Design criteria, Plumbing, Legisla-on, Costs, Maintenance.
lentifiers: South Africa.

he importance of design and its effect on the in-allation, maintenance and cost of above-ground nitary drainage in high-rise buildings is nphasied. Comments are confined to modern mplex buildings of more than 20 floors. It is in-nded to provide some useful pointers for cost-nscious developers and those responsible for umbing design. This paper deals with the present eed for the future situation and highlights the esperate need for the updating of plumbing by-ws, the establishment of a standard plumbing ode for the country, more intensive specialized ducation for architectural students, and better chnical training for apprentice plumbers. The ntent is based on the experience of a plumbing ntractor. (South Africa)
77-01388

ACELIFT TO BEAT THE FLOODS.
onstruction in Southern Africa, Vol 20(7), p 65, , 71, (1975). 3 fig.

escriptors: *Flood protection, Economics, Water supply development, *Flood control.
entifiers: *South Africa, East London, Laing am, Buffalo River.

hile the Laing Dam has always been the proper-of East London, it is now proposed that the uth African Department of Water Affairs ould take it over and spend about R5-million on tterment to improve its stability under flood nditions, as well as augmenting the water supply the King William's Town-Berlin area. (South frica)
77-01477

26M DAM PLAN FOR THE LOWVELD.
onstruction in Southern Africa, Vol 20(9), p 51, , 59, (1975). 3 fig, 2 tab.

escriptors: Irrigation, *Dam construction, Design criteria, Rockfill dams, Water require-ents, Costs, Structural geology, *Water utiliza-n, *Water supply.
entifiers: *South Africa, Crocodile River, ansvaal, Mozambique.

improve and regulate the sometimes tricky ter supply situation near Nelspruit, the Depart-ent of Water Affairs is considering the construc-n of a new dam, which will have a catchment ea in excess of 1 100 km2 and a storage capacity 167 million m3. Completion should be late in 82. A description is given of the water require-ents of the area, the geology of the site, the pposed works, and an estimate of the cost of the oject is given. (South Africa)
77-01478

8B. Hydraulics

NUMERICAL COMPUTATION OF WELL-MIXED ESTUARINE FLOWS,
Lanchester Polytechnic, Coventry (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-01139

STOCHASTIC CHARACTERISTICS OF SEDIMENT MOTIONS,
Singapore Univ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-01140

HYDRODYNAMICS OF PERCHED MOUNDS,
California State Univ., Fullerton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-01141

COMPARISON OF CHUTE AND STILLING BASIN PERFORMANCE FOR THREE DIFFERENT DROP BOX INLETS,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
W. O. Ree.
Report No. ARS-5-126, 13 p, July 1976. 19 fig, 3 tab.

Descriptors: *Chutes, *Settling basins, *Hydraulic structures, *Laboratory tests, *Hydraulic jump, *Oklahoma, Scour, Lakes, Flood control, Model studies, Hydraulics.
Identifiers: *Drop box inlets, *Stillwater(Okla), *Boomer Lake(Okla).

A dam was constructed in 1926 to create Boomer Lake at Stillwater, Oklahoma. Presently the lake serves as a cooling pond and a recreational facility. A chute spillway is proposed so that the lake may also serve as a flood control facility for the city. The site conditions and constraints indicated the need for a spillway with a long weir and a chute. The stilling basin was designed for a flow of 16,000 cfs. A model was built to a scale of 1 to 50. Three different drop (entrance box) inlets were tested and compared to determine their influence on the performance of the chute spillway and the stilling basin at the outlet of the chute. The three inlets were steep entrance box, level entrance box, and deep entrance box. Test results indicated that upstream pool levels, wave heights along the chute walls, and scour depths in the downstream channel were alike for the three entrance boxes. An advantage of the steep entrance box was a smaller associated uplift force. (Singh-ISWS)
W77-01151

METHOD FOR LOWERING GROUND WATER,
A. J. D'Amiano.
U.S. Patent No. 3,965,685, 8 p, 14 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 1946, June 29, 1976.

Descriptors: *Patents, Groundwater, *Water table, *Water levels, *Wellpoints, *Water wells, Water sources, Dug wells, Aquifers.

In order to eliminate the need to waste expensive sand, to avoid the needless labor associated with packing the sand around the well point tube and the need for a high pressure source of water at the side, a modular well point has been developed comprising an inner well point tube, having perforations at the bottom end and surrounded by a coaxial screen. Between the screen and the inner tube, there is placed particulate matter, such as gravel, and the bottom end is sealed. An annular top plate is used to seal the space around the top end of the inner tube and the screen and to seal in the gravel. The upper end of the inner tube is adapted to be coupled to a vacuum pump which pumps the water in the water table surrounding the well point down through the screen, and through the gravel, into the perforations at the bottom of the inner tube, and thence upward out the center of the tube. The prepacked well point, after installation can be removed and reused, avoiding the need for new gravel. The pre-packed modular well point can be made in predetermined lengths and connected together, modularly, to form a well point of any desired length. (Sinha-OEIS)
W77-01196

GEOTHERMAL ENERGY WELL CASING SEAL,
Sperry Rand Corp., New York, (Assignee).
H. B. Matthews.
U.S. Patent No. 3,967,448, 7 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 948, No 1, p 53-54, July 6, 1976.

Descriptors: *Patents, *Geothermal studies, *Heat flow, *Temperature, *Thermal conductivity, *Thermal properties, Energy, Energy transfer, Pumps, Steam turbines, Well casings.
Identifiers: Closed-loop steam generator, *Well casing seals.

A geothermal energy transfer and utilization system makes use of thermal energy stored in hot solute-bearing well water to generate super-heated steam from an injected flow of clean water. The super-heated steam is then used for operating a turbine-driven pump at the well bottom for pumping the hot solute-bearing water at high pressure and in liquid state to the earth's surface, where it is used by transfer of its heat to a closed-loop steam generator-turbine-alternator combination for the beneficial generation of electrical or other power. Residual concentrated solute-bearing water is pumped back into the earth. The clean cooled water regenerated at the surface-located system is returned to the deep well pumping system also for lubrication of a fluid bearing arrangement supporting the turbine-driven pump system. The deep well pump system is supported within the well casing pipe from the earth's surface by the turbine exhaust steam conduit. In view of differential expansion effects on the relative lengths of the casing pipe and the exhaust steam conduit, a flexible seal is provided between the suspended turbine-pump system and the well pipe casing. (Sinha-OEIS)
W77-01205

BREAKWATER CONSTRUCTION,
Raymond International, Inc., Houston, Tex. (Assignee).
T. Plodowski.
U.S. Patent No. 3,969,900, 6 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 948, No 3, p 885-886, July 20, 1976.

Descriptors: *Patents, *Breakwaters, *Engineering structures, *Buoyancy, Floating, Ocean waves, Barriers, Shore protection, Coastal structures, Piles(Foundations), Structural members.

Arrangements are provided whereby the sea itself is used, through buoyant action to sustain the major portion of the weight of the breakwater. These arrangements include a main module of substantially neutral buoyancy and having an upstanding wall-like surface for resisting wave action. The module is positioned so that its wall-like surface extends from below the sea surface to above the sea surface to encounter sea waves. The module is formed with front and rear portions displaced from each other in a direction transverse to the plane of the wall-like surface. A number of pile members extend down from the front and rear portions of the module and into the sea bed below to a depth sufficient to attain resistance to lateral movement of the main module. The buoyancy distribution of the module is arranged so that the front portion, that is, the portion upstream of wave action, is of negative (sinking) buoyancy

while rear portion is of positive buoyancy. This imposes a tilting force on the module in a direction counter to the forces produced by wave action. In addition the forwardmost pile-like members are prestressed in compression while the rearward pile members are prestressed in tension. As a result, the wave action of the sea in pressing against the wall-like surface acts in an untilting manner so that the stresses in the piles become relieved and the structure is enabled to withstand high sea forces. (Sinha-OEIS)
W77-01221

FLOATING BREAKWATERS,
Ishikawajima-Harima Heavy Industries Co., Tokyo (Japan). (Assignee).
T. Matsudaira, and Y. Mishina.
U.S. Patent No. 3,969,901, 5 p, 7 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 948, No 3, p 886, July 20, 1976.

Descriptors: *Patents, *Breakwaters, *Engineering structures, *Barriers, *Coastal structures, *Shore protection, Ocean waves, Floating.

The primary object of the invention is to provide an improved floating breakwater which may be held substantially at rest against the waves of expected periods without causing pitching, and which may very effectively reflect and depress or abate the waves of a wide range of wave lengths so that a safe and comparatively calm sea space may be provided behind the breakwater. A number of floating breakwater units are interconnected with each other in side by side relation and anchored to the sea bottom with anchor cables or chains. Each floating breakwater unit comprises a center float, a front and rear barrier joined with connecting members in suitably spaced apart relation or directly joined to the center float so as to define the separated spaces between them. The adjacent floating breakwater units are interconnected with suitable interconnecting means in such a way that they may be moved independently from each other to some extent and may be prevented from colliding against and parting from each other. In like manner, the adjacent buoys are interconnected with a suitable connecting member such as rope, chain or bar so that they may be normally spaced apart from each other by a desired distance. (Sinha-OEIS)
W77-01222

BREAKWATER SYSTEM FOR CREATING ARTIFICIAL SANDBARS,
C. W. Greenleaf.
U.S. Patent No. 3,971,221, 6 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 948, No 4, p 1343, July 27, 1976.

Descriptors: *Patents, *Breakwaters, *Barriers, *Waves(Water), Shore protection, Sand bars, Coasts, Suspended solids, Floating, Coastal structures.
Identifiers: Artificial sand bars.

The breakwater comprises a flotation member having a leeward end defining a pivotal axis and a structural member for applying a force to the flotation member causing it to pivot about the axis and urge the leeward end into the body of water. The first or leeward end of the flotation member dips below the surface of the water when waves of moderate strength appear. This tends to slow the flow of water, causing suspended sand to drift to the bottom, forming the beginnings of an artificial sandbar. If the waves become too great, the upwardly urged second or windward end will catch the wave crest, and as the wave passes, urge the leeward end to the surface. The leeward end thus provides minimal resistance to the larger waves, and as a result, the flotation member can 'ride out' the destructive force of such waves. When waves of moderate strength reappear, the leeward end of the flotation member will again impede the water flow, causing more sand to gravitate to the seabed. Ultimately, enough sand will drop to the bottom to form an artificial sandbar. The resulting sandbar will typically have all of the shore protection features of the massive, bulk-fill breakwaters. The sandbar, however, is produced at minimal cost and without the obvious transportation and construction problems. After the artificial sandbar has been constructed, the breakwater can be moved to other locations for creating additional sandbars.
W77-01231

DISCHARGE CHARACTERISTICS OF SPACED SLITS IN POLYETHELENE PIPES UNDER PULSATING PRESSURE CONDITIONS,
Pretoria Univ. (South Africa). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-01443

VORTEX VELOCITY PREDICTION WITH EMPHASIS DIRECTED TOWARD VORTEX TUBE SEDIMENT TRAP DESIGN,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
R. J. Edling, B. J. Barfield, and C. T. Haan.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975. Chicago, Illinois. 25 p, 5 fig, 2 tab, 14 ref.

Descriptors: *Sediments, *Sediment control, *Mathematical models, Model studies, Velocity, Design criteria, Forecasting.
Identifiers: *Vortex velocity(Sediments).

The variation in coefficients relating mean velocity, wall velocity and vortex perimeter velocity indicate the values from the empirical technique, if used, could only be considered as rough estimates. The agreement between the expected pattern of stream function and the predicted pattern and the approximation of upper slot and mainstream measured velocities by the mathematical model encourage further work with the model. Closer agreement between measured and predicted values is desirable, however, the present model gives a first order approximation. It is recommended that changes in the lower boundary conditions for turbulence kinetic energy, dissipation and vorticity be studied. Successful prediction of the point mean velocity and turbulent parameters in complex flows would have many applications. (Skogerboe-Colo St)
W77-01520

8C. Hydraulic Machinery

WET COOLING TOWER WITH PLUME ELIMINATOR,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 5G.
W77-01193

WAVE ENERGY MACHINE,
E. J. Paradiso.
U. S. Patent No. 3,965,679, 5 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 947, No 5, p 1944, June 29, 1976.

Descriptors: *Patents, *Energy, *Energy conversion, *Energy dissapation, *Waves(Water), Energy transfer, Coastal structures, Equipment.

A device for utilizing wave energy that is otherwise lost, or spent in eroding shore lines and/or shore facilities has a combined trough-turbine arrangement. An inclined ramp, curved and triangular deflectors, bucket-wheel combinations, and turbine guards combine with a flywheel to provide smooth-flowing power from wave energy. The interrelationships of the various parts reduces turbulence and increases the thrust of an incomi volume of wave energy to rotate a shaft fro which power can be derived. (Sinha-OEIS)
W77-01194

GEOTHERMAL ENERGY WELL CASIN SEAL,
Sperry Rand Corp., New York, (Assignee).
For primary bibliographic entry see Field 8B.
W77-01205

OCEAN THERMAL GRADIENT POWE PLANT,
E. J. Beck.
U. S. Patent No. 3,967,449, 8 p, 3 fig, 5 ref; Of cial Gazette of the United States Patent Offi Vol 948, No 1, p 54, July 6, 1976.

Descriptors: *Patents, *Thermal power, *Ocea *Sea water, Hydraulics, Fluid mechani Hydraulic systems, Temperature, Energy, Ener transfer, Thermal powerplants.
Identifiers: *Thermal gradient.

An ocean thermal gradient power plant utilizes concept of converting the potential and/or kine energy developed as a low pressure, high speci volume steam to a hydraulic or kinetic work head in seawater. The plant comprises a hull h ing a pair of air-evacuated, partially submer compartments. Each compartment contains static hydraulic head and is interconnected w the other compartment above the level of the st hydraulic heads. One compartment contains steam-lift pump which, in addition to the st head, creates a hydraulic working head. The wa from the hydraulic working head drives a turb and then exits the compartment to an intermedi depth. Steam from the steam-lift pump is dra into the other compartment where it is conden by a barometric condenser. The water in this co partment exits via a pipe extending from the le of the static hydraulic head to an intermedi depth. A Taylor compressor is located at the fice of the pipe to remove any collected air fr the system. (Sinha-OEIS)
W77-01206

CONNECTING CHANNEL BETWEEN TW DIFFERENT WATER LEVELS,
V. Bauzil.
U. S. Patent No. 3,967,453, 7 p, 10 fig, 8 ref; O cial Gazette of the United States Patent Offi Vol 948, No 1, p 55, July 6, 1976.

Descriptors: *Patents, *Channels, *Water lev *Flow control, *Engineering structures, Stre flow, Check structures, Weirs, Navigation.
Identifiers: Flexible obstacles.

A connecting channel arrangement between levels or water planes of different vertical heigh described so that a permanent continuous comm nication can be assured between these two wa planes. The connecting channel is obstructed p tially by multiple, flexible devices forming an stacle to the free flow of the water in the chan The flexible device assure a significant reduct of the flow and of the speed flow of the wa which would establish itself otherwise within free channel, yet permitting a permanent conn tion between the two levels. The flexibility of devices permits them to deflect out of the way the passage of floating objects such as the di passage of boats or large drifting debris. Th flexible devices are distributed over the en length of the channel to assure a uniform and c tinuous dissipation of the pressure exerted by upstream weir to the entry of the channel. flexible devices can be grouped along transve lines to form a plurality of spaced weirs along length of the channel with a small height ference in water level at each weir. The flex devices are of finger-like shape and extend ve cally and/or horizontally across the bed of channel. (Sinha-OEIS)

77-01207

MATTER OF HYDRAULICS AT STEENBRAS.
nstruction in Southern Africa, Vol 20 (9), p. 61, (1975).

scriptors: Pumped storage, Hydroelectric nts, Dam design, Tunnel design, Hydraulic ects, Africa.
ntifiers: Steenbras Dam, South Africa.

e Steenbras Scheme has been described as the st ambitious hydro-electric scheme in the ntry. When it is completed in 1979 the Mupality of Cape Town will have on its doorstep a -MW supply plant, which should adequately er for the city's requirements for many years to ne. A few details are given regarding the dam s, the contractors, the tunnels and the pumping electricity generating equipment. (South ica)
7-01370

UTH AFRICA'S OWN SNOWY MOUNTAIN HEME,
. C. Van Robbroeck, and B. W. Graber.
nstruction in Southern Africa, Vol 20 (3), p 51-(1975).

criptors: *Dam design, Rockfill dams, Peak ru-f, Computer models, *Hydroelectric plants, mped storage, *Flood control, Irrigation.
ntifiers: Tugela River, Natal, *South Africa, falo River(So Africa), Kotongweni-Ntulwana ject, Kotongweni Dam, Ntulwana Dam, Mvue Dam.

authors propose a hydro-electric scheme on Tugela River comprising a series of dams and er stations which would be bigger than Aus-a's Snowy Mountain Scheme and would have y side benefits including flood control, irriga- and water supply. Various dam sites are cribed and the design of dams suitable for the ous sites are discussed. The proposed dams hydro-electric power stations on the Tugela er would be built to supply cheap peaking er to the inter-connected system network of South African Electricity Supply Commission will be supporting a total installed capacity of MW, comprising 3700 MW of conventional ro-plant and 1500MW pumped storage plant. th Africa)
-01374

RNESSING THE CUNENE'S MIGHT.
struction in Southern Africa, Vol 20 (4), p 12-1975). 2 fig.

criptors: *Hydroelectric power, *Water ly, Dam design, Tunnel design, Canals, raulic aspects, Africa.
tifiers: *South Africa, Angola, Ovambo, cana Falls, Cunene River, South West Africa, e dam, Calueque dam.

ite political uncertainties, work on the com-d South African/Angolan Cunene River me is progressing as planned. The present ate of total cost is put at R200-million, most hich will be provided by South Africa. A r constituent of the scheme, the Ruacana hydro-electric facility, while somewhat ler than its sister projects at Caborra Bassa Kariba, is nonetheless unique in many ways. e mover in the scheme has been S.W.A.'s urneed for power at present running at about 80 and expected to increase four-fold over the three years. The scheme is divided into three W phases. A description is given of the Gove the Olushandja dam, the Calueque dam and ing station, the pipelines, canals, pressure l and other civil engineering work involved ding huge underground caverns housing the anical and electrical equipment. (South a)

W77-01376

POWER AND WATER FOR SOUTH WEST AFRICA,
South West Africa Water and Electricity Corp. (Pty) Ltd., Windhoek.
For primary bibliographic entry see Field 3E.
W77-01382

THE KARAKAYA DAM AND HYDRO-ELECTRIC PROJECT IN EASTERN TURKEY,
R. J. Andrews.
The Civil Engineer in South Africa, Vol 17 (6), p 151-153, (1975). 5 fig.

Descriptors: Arch dams, *Hydroelectric power plants, *Hydroelectric power, *Multiple purpose projects, Irrigation, Economics.
Identifiers: *Turkey, *Karakaya Dam, *Euphrates River.

The Karakaya Dam and Hydro-electric project on the Euphrates River, which is one of the world's largest multi-purpose development schemes, is described. The installation of 2800-MW of hydroelectric power is previewed, combined with an irrigation scheme which will water 700,000 ha arable lands. The Karakaya Dam and Hydro-electric project (contributing 1800-MW) forms an integral part of this scheme and is located downstream of the 1240-MW Keban Project currently in the final stages of completion. An outline is presented, the river system, the geology, the gravity arch dam and powerplant, the spillway, the outline of structural analysis and the economics of the multipurpose development scheme. (South Africa)
W77-01465

THE TUGELA-VAAL STATE PROJECT, (DIE TUGELA-VAAL STAATSWATERPROJEK),
Department of Water Affairs, Pretoria (South Africa).
For primary bibliographic entry see Field 4A.
W77-01490

8D. Soil Mechanics

DAMMING THE CROCODILE.
For primary bibliographic entry see Field 6D.
W77-01472

CHANGE IN BIG DAM PLAN.
Construction in Southern Africa, Vol 20(4), p 85, 89 (1975). 1 fig, 2 tab.

Descriptors: Water supply, *Dam design, Costs, *Rockfill dams, *Planning, Dams, Dam construction.
Identifiers: *Hazelmere Dam, Mdloti River, *South Africa, Natal.

Originally conceived in 1970 for the purpose of supplying the increased urban and industrial water demand in the North Coast area, the plan for the construction on the Hazelmere Dam on the Mdloti River has been substantially revised. Investigations into all aspects of the plan carried out since the publication on the 1971 White Paper have resulted in a large increase in capacity, a change in the type of dam construction, and a steep estimated price increase from R5 million to R12,5 million. (South Africa)
W77-01476

8E. Rock Mechanics and Geology

REDUCTION OF POROSITY BY PRESSURE SOLUTION: EXPERIMENTAL VERIFICATION,
Stanford Univ., Calif. Dept. of Geophysics.
For primary bibliographic entry see Field 2F.

W77-01332

83 KILOMETRES OF RISKS AND UNKNOWNS.
For primary bibliographic entry see Field 8H.
W77-01469

FLOODS, A FISSURE AND A PERFECT HOLING.
South African Tunnelling, Suppl. to Construction in S.A. and Coal, Gold and Base Minerals of S.A., Nov. 1975, p 4-15. 1 fig, 1 tab.

Descriptors: *Outfall sewers, *Tunnel design, *Tunnel construction, Floods.
Identifiers: South Africa, Johannesburg.

The main outfall sewer to Klipspruit and to adjacent purification works at Goudkoppies, presently under construction by the Johannesburg City Council, is a completely new outfall designed to augment, and in parts to replace, the existing system. The completed R3,55 million first phase of the project is described. Despite problems caused by flooding and the intersection of a fault fissure, tunnel excavation for the first phase was successfully completed in April 1973 when a near perfect 'holing' of the tunnels was achieved. A project report is given on the first section of the Klipspruit outfall sewer. (South Africa)
W77-01470

RESEARCH WITH A PRACTICAL BIAS.
South African Tunnelling, Supplement to Construction in S.A. and Coal, Gold and Base Minerals of S.A., Nov. 1975. p 28-32. 2 fig, 1 tab.

Descriptors: *Tunnelling, Rocks, Engineering works, *Tunnel design, *Rock mechanics, Technology, *Mining engineering.
Identifiers: *South Africa, Technical assistance(Industries).

Over the last twenty years the Geomechanics Division of the South African Council for Scientific and Industrial Research (CSIR) has built up an enviable reputation for its research work in the fields of rock mechanics and, more recently, tunnelling. This research effort has been directed towards practical needs and the Division is frequently called upon to give specialist advice on tunnel projects. A review is given of the history of the Geomechanics Division of the CSIR, their present status and how it serves industry in Southern Africa. (South Africa)
W77-01471

MONITORING THE BEHAVIOUR OF ROCK TUNNELS DURING CONSTRUCTION,
For primary bibliographic entry see Field 8G.
W77-01475

8F. Concrete

KERBS AND CHANNELS,
National Physical Research Lab. Pretoria (South Africa).
A. J. Jobson.
Municipal Engineer, Vol 5 (4), p 32-51, (1974). 3 fig, 1 tab.

Descriptors: *Stormwater, *Urban drainage, *Channels, Construction, *Construction costs.
Identifiers: South Africa, *Kerbs.

An informational guide is presented on the functions, types, specifications, methods of construction and construction costs of kerbs and channels used along the edges and central medians of our roads and streets in South Africa. The three basic categories of barrier kerbing, mountable kerbing and flush kerbing are described, together with safety developments such as redirective kerbs,

reflective kerbs, and concrete median barriers. Information is included on kerbside stormwater inlets as an integral part of kerbing and channeling, and on the recent introduction of extruded concrete kerb and channel construction by slipform paver. Based on well-established methods of construction an indication is given of the labour, plant and materials used, the rates of production achieved and construction costs for township streets. (South Africa)
W77-01389

8G. Materials

METHOD FOR PREVENTING SCALE IN SALINE WATER DESALTING APPARATUS AND SALINE WATER RECLAMATION APPARATUS FOR CARRYING OUT SAID METHOD,
Ishikawajima-Harima Engineering Review, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W77-01215

MONITORING THE BEHAVIOUR OF ROCK TUNNELS DURING CONSTRUCTION,
Z. T. Bieniawski, and R. K. Maschek.
The Civil Engineer in South Africa, Vol 17(10), p 255-264, (1975). 10 fig, 1 tab, 16 ref.

Descriptors: *Tunnel design, Tunnel construction, *Monitoring, Instrumentation, *Measurement.
Identifiers: South Africa.

Presents practical information for both tunnel designers and constructors on the applications and advantages of in situ measurements of ground displacements during construction of tunnels built in rock. The purpose and meaning of such measurements is outlined and the recommended instrumentation described. Practical information is given for the selection, installation, operation and protection of the monitoring equipment. Results are presented of a one-year long tunnel monitoring program involving sixteen measuring stations in a major railway tunnel. These results are interpreted by taking into account other relevant data recorded during construction, such as rock mass classification, rate of face advance and the amount of support used. The monitoring of tunnel behaviour, by allowing a better assessment of rock mass conditions, tunnel stability and the effectiveness of support measures, results in considerable economic advantages to the owner, better design for the engineer and more efficient construction for the contractor. (South Africa)
W77-01475

JOINT SEALING PROBLEMS IN WATER RETAINING STRUCTURES IN JOHANNESBURG,
Johannesburg City Engineer's Dept. (South Africa).
J. E. Kendall, and D. W. Osborn.
The Civil Engineer in South Africa, Vol 17(6), p 135-142, (1975). 11 fig, 3 tab, 5 ref.

Descriptors: Sealants, *Construction joints, Reservoir design, *Reservoir leakage, Reservoir construction, Design criteria, Bacteria, Africa, *Synthetic rubber.
Identifiers: South Africa, Neoprene seal, Polysulphide synthetic rubber, Johannesburg.

The importance of joints in water retaining structures and methods and materials used to seal joints against leakage are described. The failure of jointing at Dunkeld reservoir, its temporary and subsequent permanent repair with a 'bandage' joint seal of polysulphide synthetic rubber compound is fully detailed. The unexpected bacterial attack and degradation of the polysulphide is described and a detailed account of laboratory investigations into the nature of this failure follows. If the long term performance of a Neoprene bandage seal confirms the initial success of this material in Randjeslaagte and Yeoville reservoirs it is suggested that the bandage seal could well eliminate the need for costly waterbars in water retaining structures and attendant construction difficulties. (South Africa)
W77-01479

SEWER LINING,
Council for Scientific and Industrial Research, Pretoria (South Africa).
P. R. Crabtree.
Municipal Engineer, Vol 5 (5), p 13-17, (1974). 9 ref.

Descriptors: *Deterioration, Sewerage, *Linings, *Plastic pipes, *Plastics, Maintenance, Maintenance costs, Monitoring, *Sewers.
Identifiers: South Africa, Television monitoring.

A new technique is described for the renewal of deteriorated sewers namely, a plastic sleeve relining technique whereby high-density polyethylene liners are pulled into existing sewers to restore watertightness and integrity. The process of insert-renewal begins by cleaning and TV inspection of the old sewer. Advantages of and problems with the linings are described. Sewerage engineers are asked to consider the insertion-renewal technique as an alternative to re-excavation, particularly where serious disruption in heavily built-up areas may result from the latter operation. (South Africa)
W77-01491

8H. Rapid Excavation

THE ORANGE-FISH TUNNEL - THE LONGEST AQUEDUCT IN THE SOUTHERN HEMISPHERE (DIE ORANJE-VISTONNEL - LANGSTE AKWADUK IN SUIDELIKE HALFROND).
For primary bibliographic entry see Field 8A.
W77-01384

83 KILOMETRES OF RISKS AND UNKNOWNS.
South African Tunneling, Suppl. to Construction in S.A. and Coal, Gold and Base Minerals of S.A., June 1975, p 6-19. 1 fig.

Descriptors: *Tunneling, *Tunnel design, Ventilation, *Diversion structures, *Inter-basin transfers, Water utilization, Construction.
Identifiers: *South Africa, Verwoerd Dam, *Orange River Project, Theebus River, Fish River.

A special report on the Orange-Fish tunnel is presented. The tunnel is the longest continuous tunnel in the world and one of the most ambitious engineering projects ever undertaken in South Africa. The 82,4 km tunnel will divert water from the Orange River to the Eastern Cape Province where it will be used for irrigation, industrial and urban use. This comprehensive report, after an historic review gives full details of site investigations, preliminary works, design and construction, construction problems, the intake tower and the underground control works. (South Africa)
W77-01469

9. MANPOWER, GRANTS AND FACILITIES

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Polytechnic Inst. of New York, Brooklyn.
For primary bibliographic entry see Field 6B.
W77-01344

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Bureau of Reclamation, Denver Colo.
For primary bibliographic entry see Field 6B.
W77-01342

10. SCIENTIFIC AND TECHNICAL INFORMATIO

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INFORMATION DISSEMINATION IN WATER RESOURCES FIELD,
Missouri Water Resources Research Ce Columbia.
For primary bibliographic entry see Field 10D
W77-01191

10C. Secondary Publication And Distribution

INFORMATION DISSEMINATION IN WATER RESOURCES FIELD,
Missouri Water Resources Research Ce Columbia.
For primary bibliographic entry see Field 10D
W77-01191

COAL AND THE ENVIRONMENT, ABSTR SERIES, MINE DRAINAGE BIBLIOGRA 1910-1976.
Bituminous Coal Research, Inc., Monroeville
For primary bibliographic entry see Field 5G.
W77-01192

WILDLIFE AND OIL SHALE, A PROB ANALYSIS AND RESEARCH PROG VOLUME II, APPENDIX.
Thorne Ecological Inst., Boulder, Colo.
For primary bibliographic entry see Field 5C.
W77-01236

ANNOTATED BIBLIOGRAPHY OF LAKES, PONDS, AND RESERVOIRS OF YORK STATE THROUGH 1974 (EXCLU OF LAKES ERIE AND ONTARIO),
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2H
W77-01418

COMPILATION OF STATE DATA FOR E SELECTED TOXIC SUBSTANCES, VOL ANNOTATED BIBLIOGRAPHY OF S DATA AND INFORMATION SOURCES,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 5A
W77-01494

10D. Specialized Information Center Services

INFORMATION DISSEMINATION IN WATER RESOURCES FIELD,
Missouri Water Resources Research C Columbia.
Stanley E. Manahan.
Available from the National Technical Inf tion Service, Springfield, VA 22161 as PB-2
Price codes: A03 in paper copy, A01 in micr
Partial Completion Report, June 28, 1976. 4 fig, 2 tab. OWRT X-145-MO(NO4269)(1).

scriptors: *Information retrieval, *Information change, Water resources, Indexing, Documentation, Bibliographies, Data collections.
ntifiers: *Information dissemination, omputer searches, Abstracting services.

e process of information dissemination in the d of water resources has been examined from viewpoint of the user-researcher. It is concluded that no other aspect of water resources earch is more important than information dissination, particularly from researcher to user. examining computer searches retrieved from information base of the Water Resources entific Information Center (WRSIC) system it s ascertained that the WRSIC system is a very ful medium for information transfer; however, s not being used to its full potential largely ause of lack of promotional visibility. The sent status of information dissemination in the er resources field is evaluated and recommenions are made for an expanded system involvstate directors in an integrated system of infortion dissemination. Through reorganization and e reordering of priorities, such a system can be lemented without substantially greater ex-
se.
7-01191

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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VOLUME 10, NUMBER 4
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 4
FEBRUARY 15, 1977

W77-01551 -- W77-02075

he Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the ansaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF ADSORBED WATER PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
For primary bibliographic entry see Field 5A.
W77-01563

SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF WATER ADSORBATE PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
For primary bibliographic entry see Field 5A.
W77-01564

2. WATER CYCLE

2A. General

A MODEL STUDY OF THE EFFECTS OF ARTIFICIAL RECHARGE,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W77-01883

TWENTY-SIX-YEAR CYCLICAL DISTRIBUTION OF DROUGHT AND FLOOD IN CEARA, BRAZIL,
California State Univ., Fresno.
For primary bibliographic entry see Field 2B.
W77-01897

HYDROLOGICAL AND HYDRAULICAL CONCEPTUAL MODELS APPLICABLE TO OVERLAND AND RIVER TRANSPORT MODELING,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
V. Novotny.
Wisconsin Univ., Madison, Water Resources Center, Literature Review No. 4, August 1976. 61 p. 14 fig., 13 tab., 72 ref. EPA R00514201.

Descriptors: *Hydrologic models, *Mathematical models, *River flow, *Runoff, *Methodology, Overland flow, Infiltration, Soil texture, Hydraulic conductivity, Equations, Penetration, Groundwater movement, Soil-water movement, Interception, Rainfall-runoff relationships, Depression storage, Evaporation, Evapotranspiration, Melt water, Channel flow, *Reviews, Watersheds(Basins).
Identifiers: *Literature reviews.

Various modeling methods cited in the literature are reviewed and recommendations are made for computing runoff in connection with water quality. The models are categorized into three groups: (1) Simple steady-state approximations of a phenomena; (2) time-variable or dynamic models based on analytical or numerical solution of the set of differential equations describing the phenomenon; and (3) models which utilize a transformation method to arrive at a direct input-output relationship through a system transform function. The discussion of runoff estimation models presents methods for computing runoff, complex rainfall-runoff models, rainfall-runoff relationships, and instantaneous surface runoff hydrograph equations. Modeling infiltration and groundwater flow entails the hydrologic characteristics of soil types and soil permeability rates, which are discussed in detail. Deterministic equations for the effect of surface detention as affected by land use and land slope are compared; as well as methods for estimating evaporation, evapotranspiration, and snowmelt. Mathematical models for flow routing include numerical methods, the Muskingum flow routing method, input-output transformation of flow hydrographs, channel for routing unit hydrographs, and a multiple linearization model. (Auen-Wisconsin)
W77-02036

2B. Precipitation

RESPONSE OF THE PATUXENT ESTUARY TO A WINTER STORM,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2L.
W77-01635

STOCHASTIC STRUCTURE OF CLOUD AND RADIATION FIELDS,
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
Yu. R. Mullamaa, M. A. Sulev, V. K. Poldmaa, H. A. Ohvril, and H. J. Niylisk.
NASA Technical Translation F-822, October 1975. 157 fig, 9 tab, 122 ref. Translation of 'Stokhasticheskaya Struktura Poley Oblachnosti i Radiatsii', Academy of Sciences of the Estonian SSR, p 1-283, 1972. NASA NASw-2485.

Descriptors: *Clouds, *Radiation, *Stochastic processes, Statistics, Statistical methods, Instrumentation, Equipment, Surveys, Measurement, Model studies, Mathematical models, Cloud cover, Heat transfer, Atmosphere, Meteorology.

Results were presented of theoretical and experimental studies of the stochastic structure of cloud fields and radiation of the Earth's atmosphere. A description was given of the array of equipment developed and used to conduct ground and aircraft experimental studies. A survey was made of the measurement methods and the methods of the theory of random processes employed in theoretical analysis. A detailed description was given of the results of the experimental studies, and a comparison was made with the theoretical model established. (Sims-ISWS)
W77-01640

FINAL REPORT, HIGH PLAINS COOPERATIVE PROGRAM CLOUD SURVEY AND SEEDING RESEARCH AIRCRAFT AND ASSOCIATED DATA PROCESSING,
Colorado International Corp., Boulder.
For primary bibliographic entry see Field 3B.
W77-01687

CLOUD INTERACTION AND THE FORMATION OF THE 15 JUNE 1973 TORNADO IN THE FACE MESONETWORK,
National Oceanic and Atmospheric Administration, Miami, Fla. Environmental Research Labs.
R. L. Holle, and M. W. Maier.
NOAA Technical Memorandum ERL WMPO-33, October 1976. 61 p, 39 fig, 2 tab, 23 ref.

Descriptors: *Tornadoes, *Rainfall, *Squalls, *Clouds, Storms, Florida, Oklahoma, Networks, Meteorology, Climatology.
Identifiers: *Mesonetworks.

The 15 June 1973 tornado that occurred within the FACE surface mesonetwork was measured from a series of 15 photographs taken in the vicinity. Very weak synoptic scale flow was evident at all levels to 100 mb over south Florida. A weak ridge at low levels and a slight trough at 500 mb were the only significant features in the area. Normal stability for summer 1973 was found at Miami, but shear was the weakest of the summer, equalled only on 16 June. Rainfall over Florida was related to heating, coastal, and lakeshore effects of the peninsula and not to external factors. Two clouds with tops of 15.6 km reached their peak intensity 25 km east and west of the tornado 50 minutes before its start. A new cloud line rapidly formed halfway between the original clouds; the tornado dipped from this line. The radar detected significant amounts of rain at 2 km when the tornado was at its peak intensity. Five minutes later the downdraft rain reached the funnel and caused it to dissipate. Surface rain gages measured very heavy precipitation another 5 minutes later at the old tornado position. Another tornado in Oklahoma is examined and rain shafts are seen on either side in earlier stages. This case suggests that cloud interaction in a moving squall line may by as important as that of the stationary Florida environment of 15 June. (NOAA)
W77-01700

BOUNDARY-LAYER TRAJECTORY ESTIMATES COMPARED WITH CONSTANT-VOLUME BALLOON TRAJECTORIES IN THE GREAT PLAINS,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
W. H. Hoecker.
NOAA Technical Memorandum ERL ARL-59, August 1976. 35 p, 10 fig, 2 tab, 6 ref.

Descriptors: *Great Plains, *Meteorological data, *Forecasting, *Boundary layers, *Balloons, Winds.
Identifiers: *Geostrophic wind vectors, Tetroons, *Air trajectories.

The reconstruction of boundary layer air trajectories traced out by constant-volume balloons (tetroons) flown in the Great Plains is described. The tetroons, flown at 300 m above the ground, were deployed in September and October of 1971 during periods of strong southerly, weak northerly and moderate to strong westerly winds. Use was made of geostrophic, layer average and adjusted surface winds in the reconstructions. The accuracy of the reconstructed, or estimated, trajectory was based on the distance the estimated trajectory missed the tetroon recovery site at its closest approach. Trajectories were computed for approximately the same length of time that the tetroons were aloft. Calculations suggest that reasonably accurate boundary-layer trajectories can be constructed by using geostrophic wind vectors backed by about 20 deg. in southerly and westerly winds, and 40 deg. in northerly winds. Such trajectories can be quickly and easily determined from sea-level synoptic maps. Also, trajectory forecasts can be made by this technique from the prognostic surface maps issued by the National Weather Service. (NOAA)
W77-01701

SUMMERTIME RADAR ECHO DISTRIBUTIONS OF MOIST CONVECTION OVER SOUTHERN NEVADA AND ADJACENT AREAS FOR 1971 AND 1972,
National Oceanic and Atmospheric Administration, Las Vegas, Nev. Air Resources Lab.
D. Randerson.
NOAA Technical Memorandum ERL ARL-58, August 1976. 41 p, 14 fig, 3 tab, 15 ref.

Descriptors: *Precipitation(Atmospheric), *Nevada, *Winds, *Climatology, *Thunderstorms, Orography, Convection, Storms, Radar, Distribution patterns, *Spatial distribution, *Temporal distribution.
Identifiers: *Radar echo distributions, *Moist convection, Desert thunderstorms.

Two warm seasons of hourly radar echo activity are used to develop a preliminary climatological picture of the spatial and temporal distributions of moist convection over southern Nevada and adjacent areas. The echo distributions are adjusted

for the probability of radar detection of surface precipitation. Results of the analysis quantitatively portray the enhancement of echo activity by mountainous terrain. During daylight hours, the high mountainous areas are shown to receive approximately 2 to 3 times more echo activity than the desert valleys and roughly 5 times more activity between midnight and 0700 LST. Spatial variations in echo activity are compared with different categories of K-index and precipitable water. The results suggest that by relating the spatial distribution of echoes to these stability parameters, measured from a single station, quantitative estimats can be made of the spatial variability of echo activity over a rather large area. In addition, local variations in radar echo activity are related to the 500-mb wind directions measured from a rawinsonde station located in the center of the area of analysis. Results show a strong dependency of echo activity for flow with an easterly component. (NOAA)
W77-01702

AN EVALUATION OF PRECIPITATION PH DATA FROM THE WASHINGTON, DC AREA COLLECTED DURING 1975,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
J. M. Miller, G. F. Cotton, D. H. Pack, J. M. Mitchell, and M. E. Smith.
NOAA Technical Memorandum ERL ARL-57, August 1976. 27 p, 8 fig, 4 tab, 5 ref, append.

Descriptors: *Precipitation(Atmospheric), *Meteorological data, *Rain, *Snow, Hydrogen ion concentration, District of Columbia, Acidity.
Identifiers: Air quality measurement, *Acidity of precipitation.

An experimental volunteer program to collect precipitation for determination of pH was begun in April, 1974. The purpose was to gain practical experience in collection and analysis and some data on the acidity of precipitation in the Washington DC area. Rain or snow is collected in Taylor 4 inch diameter plastic rain gages by volunteers, transferred to washed plastic bottles, tightly capped, and brought to the ARL offices in Silver Spring. pH measurements are made with a Fisher electrode and an Orion 401 pH meter following the manufacturer's instructions. pH determinations are usually made within 12-48 hours of collection. The pH values compare well with pH values measured in the Northeastern U.S. (NOAA)
W77-01703

AN AID TO AGRICULTURAL DEW FORECASTING,
National Weather Service, Fort Worth, Tex. Southern Region.
N. P. Cimino.
NOAA Technical Memorandum NWS SR-87, September 1976. 11 p, 2 tab, 4 ref, append.

Descriptors: *Dew, *Forecasting, *Agriculture, *Weather, Agroclimatology, Equations, Texas, Oklahoma.
Identifiers: *Dew forecasting, *Forecast equations.

Equations which forecast dew intensity, starting time and drying time are presented. The limited developmental data make these equations probably not as rigorous as needed for a sound agricultural forecast program, but they do supply the forecaster with a useful tool to aid in dew forcasting. Verification of the dew intensity equation on independent data does indicate reasonable skill for both the area of development (Weslaco, Texas) and a separate area (Oklahoma City). The present system does not supply feedback of verifying observations which is prerequisite to improving the forecasting of dew. (NOAA)
W77-01704

WATER WHEEL ALL SEASON RAIN GAGE,
For primary bibliographic entry see Field 7B.
W77-01753

DUST STORMS,
S. B. Idso.
Scientific American, Vol. 235, No. 4, p 108-114, October, 1976. 2 tab.

Descriptors: *Dust storms, *Soil erosion, *Wind erosion, Dusts, Loess, Winds, Meteorology, Human diseases, Forecasting, Satellites(Artificial), Deserts, Arid lands, Precipitation(Atmospheric), Humidity, Vegetation, Moisture.
Identifiers: *Haboob, *Valley fever.

Dust storms play an important role in changing the surface of the planet and have a significant impact on the people living in arid lands. The dynamics of dust storms, their effects, the areas where they most frequently occur, and the studies that have been completed about them, are evaluated. The most direct threat of dust storms is soil erosion. The primary method of controlling erosion by wind is to maintain a surface cover, if rainfall is below normal for two years and the amount of crop residue produced is small, tillage may be required as an emergency measure to reduce soil erosion. The relationship between cool air, rainfall and dust storms is discussed. This type of dust storm, the haboob, from the Arabic word for violent wind, is associated with the rainy season in the Sudan and in the Arizona desert. The use of meteorological satellites in the study and possible forecasting of dust storms is evaluated. (Jamail-Arizona)
W77-01895

TWENTY-SIX-YEAR CYCLICAL DISTRIBUTION OF DROUGHT AND FLOOD IN CEARA, BRAZIL,
California State Univ., Fresno.
C. Markham.
The Professional Geographer, Vol. 27, No. 4, p 454-456, November, 1975. 1 fig, 1 tab, 4 ref.

Descriptors: *Flood forecasting, *Flood recurrence interval, *Rainfall, *Excessive precipitation, *Air circulation, *Droughts, Atlantic Ocean, Sea breezes, Atmosphere, Precipitation(Atmospheric), Meteorology, Water shortage, South America, *Cycles, Hydrologic budget.
Identifiers: Periodicity, Sea temperature, *Brazil.

In Northeastern Brazil high annual rainfall brings floods and lack of it causes drought. This paper examines the cycles of drought and flood in the region. Rainfall records are examined from 1850 to 1973 and data is presented showing the occurrence of wet and dry years at the three stations studied aligned in cycles of twenty-six years. From records of one of the stations examined, the chi-square significance text applied to the power spectrum shows less than one-percent probability that this twenty-six-year periodicity is the result of chance. A cause for the periodicity is not known, but may be a long-term resonance in the ocean-atmosphere system governing the mean position of the intertropical convergence as well as equatorial sea temperatures. Atlantic sea temperatures may prove to be the basis for long-range drought and flood forecasts in Brazil, even if the twenty-six-year periodicity proves to be spurious. Assuming that the periodicities will continue into the future, forecasts for floods and droughts can be made for Northeastern Brazil. (Jamail-Arizona)
W77-01897

RAINFALL EROSIVITY OVER RHODESIA.
Rhodesia Univ., Salisbury. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-01901

AN EXAMINATION OF THE RELIABILITY OF SHORT TERM RECORDS IN PRECIPITATION VARIABILITY STUDIES,
Washington State Univ., Pullman.
C. R. Schroeder, and J. K. Steingraber.
Association of American Geographers, Proceedings, Vol. 7, p 200-203, 1975. 4 fig, 2 tab, 2 ref.

Descriptors: *Weather data, *Weather forecasting, *Computer programs, *Rainfall, Precipitation(Atmospheric), Reliability, Climatic data, Climatology, Meteorology, Variability, Data collections, Meteorological data, Cycles, United States.

The thirty-year period of record often employed in precipitation studies seems of dubious validity when based upon the assumption that it is representative of the precipitation variability for a longer period of time. A study was conducted utilizing climatological data for an eighty-one-year period of record (1880 to 1960) for thirty-nine stations. A computer program was written in FORTRAN IV to determine how many years previous to 1960 would have to be included in order to guarantee that the coefficient of variation would remain within seventy, eighty, and ninety percent levels of the eighty-one year coefficient of variation. The results indicated that the thirty-year record has little validity if it is used with the assumption that it is representative of a longer period of record. Thus, the precipitation studies of the western United States will, for the present, be hindered by a paucity of records of sufficient length. (Jamail-Arizona)
W77-01904

APPLIED CLIMATOLOGY AND FOOD PRODUCTION: THE CASE OF GRAPEFRUIT QUALITY IN THE RIO GRANDE VALLEY OF TEXAS,
Texas A and I Univ., Kingville.
For primary bibliographic entry see Field 3F.
W77-01905

ON THE POSSIBLE DETECTION OF TSUNAMIS BY A MONITORING OF THE IONOSPHERE,
Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
For primary bibliographic entry see Field 2L.
W77-01918

2C. Snow, Ice, and Frost

A THREE-DIMENSIONAL NUMERICAL MODEL OF ICE SHEETS: TESTS ON THE BARNES ICE CAP, NORTHWEST TERRITORIES,
Colorado Univ., Boulder. Inst. o Arctic and Alpine Research.
M. W. Mahaffy.
Journal of Geophysical Research, Vol. 81, No. 6, p 1059-1066, February 20, 1976. 11 fig, 1 tab, 28 ref. NSF GA-40248, NSF GA-43191.

Descriptors: *Glaciation, *Model studies, *Mathematical models, *Ice, *Canada, Ice cover, Ice loads, Computer models, Glaciers, Glacial drift, Flow, Glaciology.
Identifiers: *Ice caps, *Barnes Ice Cap(Canada), *Ice sheets.

A three-dimensional numerical model of ice flow was developed to study the areal distribution of mass in an ice sheet of arbitrary shape that is not necessarily in a steady state. The model was applied to the 5900 sq km Barnes Ice Cap, Baffin Island, Northwest Territories, Canada, as a test case, and the results were compared with the present day ice cap. The results were generally consistent with glaciological and glacial geologic field evidence. The results suggested that basal sliding may be occurring beneath the southwestern

side of the present ice cap. The model has general applicability to several studies involving the question of the speed of ice sheet development and the time/load history of the last major glaciation. (Sims-ISWS)
W77-01610

SNOW-ROAD CONSTRUCTION--A SUMMARY OF TECHNOLOGY FROM PAST TO PRESENT,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
For primary bibliographic entry see Field 4C.
W77-01638

EVALUATION OF THE USE OF SALT BRINE FOR DEICING PURPOSES,
Connecticut Dept. of Transportation, Rocky Hill, Materials Testing Lab.
For primary bibliographic entry see Field 4C.
W77-01639

LOW ADHESIONAL ARCTIC OFFSHORE PLATFORM,
Chevron Research Co., San Francisco, Calif. (Assignee).
For primary bibliographic entry see Field 8G.
W77-01712

LOW LEVEL SNOW PRECIPITATION GAUGE,
Idaho Industrial Instruments, Inc., Boise, (Assignee).
R. G. Morrison.
U.S. Patent No. 3,975,641, 7 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1214, August 17, 1976.

Descriptors: *Patents, *Precipitation(Atmospheric), Precipitation gages, Snowfall, Precipitation intensity, Instrumentation, Radioisotope, Background radiation, Electromagnetic waves.

This invention relates to the accurate gauging of precipitation accumulated at a given location over a prolonged period of time and provides a continuous measure of above ground water inventory. A mixture of naturally occuring aggregate and radioactive substances, such as uranium or thorium bearing ores and ordinary binders, such as asphalt or cement, are utilized. The mixture is formed into a geometrical configuration, such as a ring, with sufficient isotopic inventory to create an isoflux line at a detector of approximately 15 times the natural background radiation. The radioactive, ring-shaped source serves as a transmitter of electromagnetic signals emitted from a geometrically fixed zone to a point detector at a fixed location. The ring source and point detector thus forms a convergent isoflux at the detector. The measurement of the attenuation of the transmitted signals then establishes the density of the substances accumulated between the source and the detector. Any change in this attenuation can thus be correlated to water which is a measure of precipitation. (Sinha-OEIS)
W77-01744

ICE CONDITIONS AND THE PROPOSED CONTAINMENT AND REMOVAL OF SPILLED OIL ON ST. CLAIR AND DETROIT RIVERS,
Canada Centre for Inland Waters, Burlington, (Ontario).
For primary bibliographic entry see Field 5G.
W77-01802

POTENTIAL USE OF SATELLITE IR DATA FOR ICE THICKNESS MAPPING,
Development and Resources Transportation Co., Silver Spring, Md.
L. A. LeSchack.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 490, Price codes: A03 in paper copy, A01 in microfiche. Final Report, March 1975. 28 p, 8 fig, 3 tab, 4 ref. NOAA-NESS 3-35384.

Descriptors: *Remote sensing, *Ice, *Mapping, *Arctic, Sea ice, Ice cover, Temperature, Infrared radiation, Satellites(Artificial), Forecasting, Dimensional analysis, Analytical techniques, Data processing.
Identifiers: *Ice thickness, Ice reporting, Ice movement, Infrared mapping.

An approach to automated mapping of the thickness and movement of Arctic ice by means of statistical examination of NOAA VHRR satellite IR data was discussed. In previous work a useful empirical relationship was observed: airborne or satellite radiant temperature measurements of sea ice are proportional to the thickness of the ice, have normal distriburtions, and the areas beneath the distribution curves are proportional to the surface area of the pack ice types from which they were derived. In the present work, substantially more data were examined so that it is now possible to outline the basic steps for implementing an algorithm to automate ice mapping. Five passes made by NOAA-2 and NOAA-3 satellites were used for the analysis. These passes provided radiant temperature data of the Beaufort Sea ice during January, February, March, April, and May 1974. Examination of the shapes of the temperature distribution histograms derived from the data suggested differences that could be delineated by simple statistical techniques. (Sims-ISWS)
W77-01913

ON THE DEVELOPMENT OF A SEASONAL CHANGE SEA-ICE MODEL,
National Center for Atmospheric Research, Boulder, Colo.
W. M. Washington, A. J. Semtner, Jr., C. Parkinson, and L. Morrison.
Journal of Physical Oceanography, Vol. 6, No. 5, p 679-685, September 1976. 3 fig, 1 tab, 15 ref.

Descriptors: *Sea ice, *Model studies, *Arctic, *Antarctic, Mathematical models, Radiation, Solar radiation, Heat transfer, Ice, Ice cover, Seasonal, Distribution patterns, Distribution, Oceans, Oceanography.

A three-dimensional thermodynamical model of sea ice was developed which is capable of simulating seasonal changes over the Arctic and Antarctic regions. The model was patterned after the earlier work of Maykut and Untersteiner and Semtner. Instead of specifying the fluxes of energy at the top of the ice as is usually done in sea ice modeling, the components of surface energy balance were computed from observed climatological atmospheric data. Also, a new parameterization of leads by Semtner was tested and shown to improve the simulation. The model results agreed with observations in the Arctic, but the results were less successful in the Antarctic. Possible reasons for deficiencies of the model were that ice transport is not included and oceanic heat flux is not properly accounted for. These aspects will be added and improved in future development of the model. (Sims-ISWS)
W77-01925

SNOW DAMAGE IN ARIZONA PONDEROSA PINE STANDS,
Forest Service (USDA), Tempe, Ariz.; Forest Hydrology Lab.; and Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W77-01949

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS AND LANDSAT DATA-COLLECTION SYSTEM OPERATIONS IN CENTRAL ARIZONA,
Geological Survey, Tucson, Ariz.
H. H. Schumann.
In: Arizona Water Commission Report No 7; Proceedings of 19th Annual Arizona Watershed Symposium, September 24, 1975, Phoenix, Arizona: Arizona Water Commission, p 24-30, 1975. 8 fig, 1 tab, 4 ref.

Descriptors: *Snow cover, *Snowmelt, *Remote sensing, *Satellites(Artificial), *Telemetry, Snow surveys, Hydrologic data, Aerial photography, Reservoir operation, Arizona, Flood control, Watershed management.
Identifiers: *Salt-Verde watershed(Ariz).

Repetitive Landsat and NOAA-4 satellite imagery together with aerial surveys are being evaluated to develop an operational capability for mapping snowcover distributions on the Salt-Verde watershed of central Arizona. Satellite telemetry is being used also for near-real time relay of hydrologic data to aid in the management and operation of reservoirs on the Salt and Verde Rivers. For use in rating satellite imagery, the depth and distribution of snowcover was measured by examination of oblique aerial photographs of snow markers. This method allowed rapid and economical determination of snow depths. The Landsat Data-Collection System (DCS) relays hydrologic data from remote and relatively inaccessible earth-based sensors. The Landsat telemetry system relays information from streamflow- and snow-monitoring installations located in the upper parts of the Salt-Verde Watershed. (Woodard-USGS)
W77-02017

2D. Evaporation and Transpiration

SOIL WATER CONTENT AND EVAPORATION DETERMINED BY THERMAL PARAMETERS OBTAINED FROM GROUND-BASED AND REMOTE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W77-01618

THE MOVEMENT OF SNOW-WATER THROUGH SMALL PLANT-SOIL SYSTEMS IN THE MEDICINE BOW MOUNTAINS, WYOMING,
Wyoming Univ., Laramie. Dept. of Botany.
D. H. Knight, and A. T. Harrison.
Wyoming Water Resources Research Institute, Laramie, Water Resources Series No. 62, April 1976. 65 p, 6 tab, 17 fig, 47 ref. OWRT A-011-WYO(2), 14-31-0001-3551, 3851, 4051, 5051.

Descriptors: *Soil-water-plant relationships, *Transpiration, *Melt water, Nutrient requirements, Coniferous forests, *Wyoming, Lodgepole pine trees, Snowmelt, Interception, Soil water movement.
Identifiers: *Medicine Bow Mountains(Wyo).

Data are presented which show the significance of various pathways for the movement of snowmelt water through a stand of lodgepole pine forest in the Medicine Bow Mountains, southeastern Wyoming. Patterns of precipitation, interception, soil water recharge, and transpiration are described. The data suggest that nearly all of the water transpired comes into this system as snow and that all of the snow water could be transpired by the trees. The significance of transpiration when the ground is snow-covered is emphasized. If nearly all of the average water input to the stand is transpired, nutrient loss from the stand by leaching would occur only during years of heavier-than-normal snowfall. Throughfall of snow is thought to be nearly 100%; throughfall of summer showers ranged from 56-80%. Data on litter interception and soil waterholding capacity are presented. Transpiration for the stand was estimated to be 6.8 liters per square meter per day in

late June and early July. The maximum transpiration rate for a single tree was 3.5 liters per hour at midday, with nighttime transpiration greatly reduced. Stomatal regulation of transpiration during the day was observed in late July and August.
W77-01812

APPLIED CLIMATOLOGY AND FOOD PRODUCTION: THE CASE OF GRAPEFRUIT QUALITY IN THE RIO GRANDE VALLEY OF TEXAS,
Texas A and I Univ., Kingville.
For primary bibliographic entry see Field 3F.
W77-01905

ABSCISIC ACID LEVEL IN TOMATO LEAVES AFTER A LONG PERIOD OF WILTING,
Aarhus Univ., (Denmark). Inst. of Plant Physiology.
For primary bibliographic entry see Field 2I.
W77-01906

USE OF CONSTANT LEVEL JAIN EVAPORIMETER IN SCHEDULING IRRIGATION,
Udaipur Univ. (India). Dept. of Agronomy.
T. C. Jain.
Annals of Arid Zone, Vol. 14, No. 1, p 25-28, 1975. 2 ref.

Descriptors: *Evaporimeters, *Evaporation, *Water loss, Irrigation, Moisture deficit, Soil moisture, Evapotranspiration, Moisture content, Root zone, Soil water, Moisture stress, Crop production, Soil water movement, Irrigation effects, Measurement, Asia.
Identifiers: *Jain evaporimeter.

Recent research in irrigation shows that the rate of evapotranspiration or soil moisture depletion from a cropped area depends on the soil moisture content of the effective root zone and the evaporative demand of the atmosphere. The use of a Constant Level Jain Evaporimeter to measure the evaporative demand of an atmosphere and thus for scheduling irrigation is discussed. This device consists of a can with water connected by a tube to a bottle filled with water. As soon as the water in the can evaporates, it is refilled with water from the bottle and hence the amount of water evaporated can be accurately read from graduation in the bottle. The equipment is simple, easily handled by skilled farmers, economical, and is a good indicator of evaporative demand. (Jamail-Arizona)
W77-01907

THERMAL MODELING AND ITS RELATION TO CANAL EVAPORATION,
Geological Survey, Bay St. Louis, Miss.
H. E. Jobson.
In: Energy Recovery; Proceedings of the Third National Conference on Complete Watereuse--Symbiosis as a Means of Abatement for Multi-Media Pollution, June 27-30, 1976, Cincinnati, Ohio: American Institute of Chemical Engineers and Environmental Protection Agency Technology Transfer, p 370-379, 1976. 4 fig, 19 ref.

Descriptors: *Evaporation, *Canals, *Model studies, *Heat transfer, *Heat budget, Computer models, Methodology, Mass transfer, Air-water interfaces, *Water temperature, Evaluation, *California.
Identifiers: *San Diego aqueduct(Calif).

The thermal balance of the 16-mile concrete-lined San Diego aqueduct in southern California was studied for a 1-year period beginning July 24, 1973. Water temperatures and meteorologic variables at each end of the canal were recorded at 10-minute intervals. The data are analyzed in the Eulerian framework by applying a one-dimensional numerical model. Preliminary results, using 28 days of data, indicate that the downstream temperature can be predicted with a root-mean-square error of about 0.25 degrees C. The data are also analyzed in the Lagrangian framework to determine the wind function for a Dalton-type evaporation formula and to evaluate the effect of various factors on the predicted downstream temperature. (See also W76-05314) (Woodard-USGS)
W77-02029

2E. Streamflow and Runoff

FLASH FLOODS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences, Publication No. 112, 1974. 141 p.

Descriptors: *Conferences, *Flash floods, *Floods, *Flood forecasting, Warning systems, Monitoring, Instrumentation, Remote sensing, Cities, Urban runoff, Flood protection, Networks, Rainfall Measurement, Precipitation(Atmospheric), Hydrologic data, Data processing, Arid lands.

Flash floods were discussed at a symposium held at Paris in 1974. The subject areas discussed were: methods for measuring flash floods; observation networks, their operation and data collection; inventory of flash floods; methods for computing; protection, forecasting networks; and economic consequences, disasters. (See also W75-07201-W75-07203, W76-00301; and W77-01934 thru W77-01944) (Humphreys-ISWS)
W77-01933

COLLECTION AND PROCESSING SYSTEM OF HYDROLOGICAL DATA DURING FLASH FLOODS ON THE RIVER YODO,
Kyoto Univ. (Japan).
T. Ishihara, Y. Inada, and M. Hayashi.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 3-8, 1974. 5 fig.

Descriptors: *Flood forecasting, *Flash floods, *Hydrologic data, *Data processing, Data storage and retrieval, Data transmission, Networks, Automation, Rainfall, Floods, Runoff, Watersheds(Basins).
Identifiers: *Japan, *River Yodo(Japan).

The data collection and processing system required to forecast and to issue warnings of flash floods on the Yodo River is now in operation. The paper described some interesting and important aspects of the practical system which involves 40 rain gages and 49 flow stations: the transformation of measured data to electric signals and their transmission by radio, the sampling interval for collection and processing of data, the methods of checking and interpolating transmitted data, and the methods of storing and computing. Processed data can be used directly for flood runoff calculation. Therefore, it is possible to forecast a flash flood and give an alarm sufficiently early. (See also W77-01933) (Humphreys-ISWS)
W77-01934

HYDRAULIC PERFORMANCE OF FLUMES FOR MEASUREMENT OF SEDIMENT-LADEN FLASH FLOODS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. E. Smith, and D. L. Chery, Jr.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 17-22, 1974. 4 fig, 4 ref.

Descriptors: *Flash floods, *Water measurement, *Floods, *Arizona, Flumes, Flow measurement, Hydrologic data, On-site investigations, Instrumentation, Hydraulics, Sediment control, Flow rates, Flood flow.
Identifiers: *Walnut Creek(Az).

A network of 11 specially designed flumes has been established on the 155 sq km Walnut Gulch Experimental Watershed, Arizona, specifically to monitor the size and propagation of flash floods typical to this region. Hydraulic problems of flash flood flow measurement were discussed, including high velocities, high sediment transport, alluvial instability, and extremely rapid increase in discharge rate (shock fronts). Several possible improvements for these flumes were suggested as a result of extensive model testing, prototype measurements now in progress, and several years of experience with flow peaks as large as 140 cu m/s. (See also W77-01933) (Humphreys-ISWS)
W77-01935

FIELD MONITORING EQUIPMENT FOR HYDROLOGICAL STUDIES IN A SMALL CATCHMENT,
Bristol Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W77-01936

DISASTERS CAUSED BY FLASH FLOODS,
National Research Center for Disaster Prevention, Tokyo (Japan).
T. Kinosita.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 67-72, 1974. 6 fig, 1 tab, 4 ref.

Descriptors: *Flash floods, *Instrumentation, *Warning systems, Flood forecasting, Rain gages, Disasters, Monitoring, Urbanization, Topography, Climate, Rivers, Runoff, Forecasting.
Identifiers: *Japan.

The climatic and topographic reasons for flash floods in Japan were discussed. Runoff characteristics are affected by man's activities, such as urbanization and river improvement works. Warning systems must be improved to keep pace with social developments. A flash flood warning system is generally designed to locate heavy rainfall and to disseminate information as soon as possible. Weather radar is one instrument that has been used successfully to locate areas of intense rainfall. A telephone rain gage is another instrument system convenient for flood warning purposes. If the appropriate number is dialed, a telephone line is connected to the pulse counter of the tipping bucket rain gage. After a short announcement of the name of the station, the number stored in the counter is sent by a tone pulse. Anyone and any computer can collect rainfall data from any place using such a system. Another simple warning device is an oil can with a small orifice. An electrode which is fixed at a certain level can find the water level which corresponds to the warning intensity of rainfall. An alarm lamp or buzzer warns people of the impending flash flood. (See also W77-01933) (Humphreys-ISWS)
W77-01937

OPERATIONAL ARRANGEMENT OF RAIN GAUGE STATIONS IN FORECASTING FLASH FLOODS,
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 4A.
W77-01938

WARNING SYSTEM FOR SEVERE FLOODS,
Water Survey of Canada, Calgary (Alberta).
For primary bibliographic entry see Field 7B.
W77-01939

FLOOD MEASUREMENTS IN AN URBAN ENVIRONMENT: A DATA USER'S VIEWPOINT,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-01940

THE OPERATIONAL USE OF DIGITAL RADAR DATA FOR FLASH FLOOD MONITORING,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 7B.
W77-01941

SYSTEMS FOR PREPARING TIMELY FLASH FLOOD WARNINGS,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W77-01942

FLASH FLOODS IN INDIA,
Central Water and Power Commission, New Delhi (India).
P. Singh, A. S. Ramanathan, and V. G. Ghanekar.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 114-118, 1974. 2 fig, 3 ref.

Descriptors: *Flash floods, *Warning systems, *Organizations, Flood forecasting, Floods, Flood frequency, Instrumentation, Flood damage.
Identifiers: *India.

After a brief description of the magnitude and nature of floods in Indian rivers, the paper described the existing flood forecasting organization in the country and the proposed plans to augment its services. The occurrence of intense, short duration rainfall during the southwest monsoon period was examined with respect to the regions of occurrence, frequency, and magnitude. It was shown that the major portion of the country is subject to such intense rainfall with resulting flash floods. Because of the vast area and large number of streams subject to flash floods, many difficulties of a practical and financial nature are involved in providing an extensive warning system for flash floods in India. Mention was made of some flash floods which have occurred in the past few years and the damage they caused. Experience with radio-reporting rain gages as well as manned wireless reporting stations was briefly described. (See also W77-01933) (Humphreys-ISWS)
W77-01943

THE USE OF REMOTE SENSING SYSTEMS IN MONITORING DESERT FLOODS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
For primary bibliographic entry see Field 7B.
W77-01944

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIPPI RIVER BASIN--VOLUME 1. LOWER MISSISSIPPI RIVER BASIN EXCEPT ARKANSAS RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-02009

ISOTOPIC HYDROLOGY IN THE AMAZONIA 2. RELATIVE DISCHARGES OF THE NEGRO AND SOLIMOES RIVERS THROUGH O-18 CONCENTRATIONS,
Centro de Energia Nuclear na Agricultura, Sao Paulo (Brazil); and Geological Survey, Denver, Colo.
E. Matsui, F. Salati, I. Friedman, and W. L. F. Brinkman.
Water Resources Research, Vol 12, No 4, p 781-785, August 1976. 4 fig, 2 tab, 15 ref.

Descriptors: *Streamflow, *Flow rates, *Oxygen isotopes, *Hydrology, *South America, *Precipitation(Atmospheric), Runoff, Sampling, Water analysis, Ion transport, Mixing, Tributaries.
Identifiers: *Amazon River, *Negro River, *Solimoes River.

Measurements of O-18 were made on samples of water collected during a 2-year period on the Amazon below the confluence of the Negro and Solimoes rivers. The measurements show that the Amazon is not completely mixed 120 km below the confluence. Estimates of relative flows were based on the O-18 concentrations and show that the relative contribution of the Negro varied from 19% in February 1973 to 68% in July 1973. (Woodard-USGS)
W77-02016

FLOOD CHARACTERISTICS OF STREAMS IN OWYHEE COUNTY, IDAHO,
Geological Survey, Boise, Idaho.
H. C. Riggs, and W. A. Harenberg.
Water-Resources Investigations 76-88 (open-file report), August 1976. 14 p, 3 fig, 1 tab, 8 ref.

Descriptors: *Flood discharge, *Flood forecasting, *Flood frequency, *Channel morphology, Peak discharge, Gaging stations, Flow measurement, Flood recurrence interval, Sites, Maps.
Identifiers: Owyhee County(Idaho).

Channel-width measurements were used to estimate annual peaks with a recurrence interval of 10 years at 79 sites in Owyhee County, Idaho, and adjacent areas. These discharges and those from 33 gaging stations are plotted on a map of the area. The map will allow the user to interpolate between sites. (Woodard-USGS)
W77-02027

WATER-TEMPERATURE CHANGES DOWNSTREAM FROM A MAJOR RESERVOIR AT CANNONSVILLE, N.Y.,
Geological Survey, Harrisburg, Pa., and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W77-02030

HYDROLOGIC UNIT MAP--1974, STATE OF NORTH DAKOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-02031

WATER RESOURCES OF THE RAINY LAKE WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02032

HYDROLOGICAL AND HYDRAULICAL CONCEPTUAL MODELS APPLICABLE TO OVERLAND AND RIVER TRANSPORT MODELING,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-02036

2F. Groundwater

HYDROCHEMISTRY AND GROUND-WATER MIXING IN PART OF THE LINCOLNSHIRE LIMESTONE AQUIFER, ENGLAND,
Birmingham Univ. (England). Dept. of Geological Sciences; and Birmingham Univ. (England). Hydrogeology Section.
A. R. Lawrence, J. W. Lloyd, and J. M. Marsh.
Ground Water, Vol. 14, No. 5, p 320-327, September-October 1976. 6 fig, 3 tab, 11 ref.

Descriptors: *Water chemistry, *Water types, *Mixing, *Connate water, Groundwater, Groundwater recharge, Carbon radioisotopes, Bicarbonates, Sulfates, Interfaces, Fissures(Geologic), Transmissivity, Potentiometric level, Water sampling, Water wells, Graphical analysis, Limestones, Ion exchange, Reduction(Chemical).
Identifiers: *Lincolnshire limestone(England).

A hydrochemical study was outlined which demonstrates the mixing of two different groundwater types in the Lincolnshire Limestone aquifer. The two water types consist of a modern recharge water and an ancient, possibly connate water. The hydrochemistry of the 'interface zone' between the two waters was discussed in detail. In the younger water, a relationship between sulphate reduction and bicarbonate was illustrated approaching the 'interface zone' and was considered to be related indirectly to the mixing. Carbon isotope content was shown to be radically different in the various groundwaters and to support the mixing hypothesis. (Visocky-ISWS)
W77-01627

HYDROLOGY AND CHEMISTRY OF GROUND WATER IN PUNA, HAWAII,
Colorado School of Mines, Golden. Dept. of Geology.
M. Druecker, and P-F. Fan.
Ground Water, Vol. 14, No. 5, p 328-338, September-October 1976. 7 fig, 4 tab, 15 ref. NSF GI 38319, ERDA E(04-3)-1093.

Descriptors: *Water chemistry, *Hydrogeology, *Hawaii, Groundwater movement, Test wells, Perched water, Water table, Groundwater barriers, Salinity, Water temperature, Saline water intrusion, Volcanoes, Permeability, Flow rates, Discharge(Water), Water types, Sodium chloride, Sampling, Silica, Depth, Mixing, Rainfall.
Identifiers: Dike water, Basal water, Rift zone, Superheated groundwater.

An analysis was presented of the hydrology and chemistry of the groundwater of the Puna District, Hawaii, based on data from 16 drilled wells, 10 test wells, 2 shafts, and 4 exploratory thermal wells. It was found that groundwater occurs as (1) perched water located north of Mountain View, (2) dike water located along the east rift zone of Kilauea, and (3) basal water occurring throughout most of the district, except where dike water is present. The east rift zone serves as a barrier to groundwater movement as demonstrated by the difference in basal water table levels on the two sides of the rift zone. Salinity and temperature of the basal groundwater vary greatly north and south of the rift zone due to differences in precipitation, sea water intrusion, volcanic activity, flow rates, permeability, and discharge. Basal groundwater type is predominantly sodium chloride. Water samples taken from thermal test well no. 3 showed dissolved silica values two to three times higher than the 49 mg/l average for the rest of the island. Hydrologic and geologic conditions in and around Kilauea's east rift zone support the possibility of accumulations of superheated groundwater. The mixing of waters of different composition at depth proved to be the most difficult problem encountered in estimating deep groundwater temperatures. (Visocky-ISWS)
W77-01628

TRANSIENT DRAINAGE WITH NONLINEARITY AND CAPILLARITY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
D. B. McWhorter, and H. R. Duke.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings Paper 12185, p 193-204, June 1976. 4 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Equations, *Drainage, *Drains, *Groundwater movement, *Unsaturated flow, Water table, Mathematical models, Unsteady flow, Mathematical studies, Flow.
Identifiers: Drainage equation, Transient drainage.

A nonlinear partial differential equation was developed that includes the effects of capillary storage and flow above the water table. An approximate analytic solution was derived. The water table response at the midpoint between drains affected by capillary storage, flow above the water table, and the nonlinearity due to decreasing flow depth was predicted by one relatively simple expression. Indices to the degree of importance of each of these three effects were defined. It was concluded that appropriate simplified forms of the solution can be selected based on the value of the indices. The method is applicable to a wide range of conditions including drains placed at any elevation relative to the impervious substratum and for shallow as well as deep water tables. The method removes three important restrictions necessarily imposed on the classical linear drainage equations but retains their familiar and desirable features. The equations are sufficiently simple to permit computations with a calculator and should be useful in routine design calculations. (Bhowmik-ISWS)
W77-01633

OBSERVATIONS ON THE DISTRIBUTION OF CALCIUM CARBONATE IN THE SOIL AND GROUND WATERS, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
For primary bibliographic entry see Field 2K.
W77-01733

ARTESIAN AQUIFERS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W77-01761

GROUND WATER FLOW IN UNCONSOLIDATED FORMATIONS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W77-01763

DRAWDOWN DUE TO PUMPING IN AN ANISOTROPIC AQUIFER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-01769

MONITORING GROUND-WATER QUALITY: METHODS AND COSTS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01771

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01772

PHYTOSOCIOLOGIC STUDY OF MANGROVES OF TULEAR REGION (MADAGASCAR). 4. PEDOLOGIC COMPLEMENTS RELATIVE TO MANGROVES OF SONGORITELO AND OF SAINT-AUGUSTIN, (IN FRENCH),
Aix-Marseille-1 Univ. (France). Laboratoire de Phytosociologie Cartographique.
For primary bibliographic entry see Field 2H.
W77-01888

DIFFERENTIAL-HEAD--LAKE-LEVEL RELATIONSHIPS IN THE MIDDLE-GULF AREA, FLORIDA,
Water and Air Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 4B.
W77-01922

DRAWDOWN DUE TO PUMPING IN AN ANISOTROPIC AQUIFER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-01929

AN ANALYSIS OF INSTABILITIES CAUSED BY SALINITY GRADIENTS IN GROUNDWATER,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-01931

A DRAWDOWN PREDICTION MODEL BASED ON REGRESSION ANALYSIS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W77-02015

BICARBONATE CONTENT OF GROUNDWATER IN CARBONATE ROCK IN EASTERN NORTH AMERICA,
Geological Survey, Menlo Park, Calif.; and Geological Survey, Raleigh, N. C.
For primary bibliographic entry see Field 2K.
W77-02020

EFFECT OF HIGH-PRESSURE DEFORMATION ON PERMEABILITY OF OTTAWA SAND,
Geological Survey, Menlo Park, Calif.
M. D. Zoback, and J. D. Byerlee.
American Association of Petroleum Geologists Bulletin, Vol 60, No 9, p 1531-1542, September 1976. 12 fig, 31 ref.

Descriptors: *Fluid mechanics, *Hydrostatic pressure, *Aquifers, *Permeability, *Oil fields, Geology, Secondary recovery(Oil), Pore pressure, Subsidence, Laboratory tests, Evaluation, Sands.
Identifiers: *Ottawa sand.

Because subsidence and permeability loss commonly are associated with fluid production from unconsolidated aquifers and reservoirs, there is an interest in the mechanical behavior and fluid-flow properties of granular materials under high pressure and stress. An understanding of such phenomena could directly influence both primary and secondary oil-recovery operations. This report discusses a series of high-pressure laboratory experiments investigating the deformation and fluid-flow properties of an Ottawa sand under hydrostatic confining pressure, triaxial compression, and triaxial extension. During deformation, permeability and pore-volume changes were measured periodically. The hydrostatic-compression tests bear on porosity and permeability changes that accompany either burial or formation pore-pressure changes associated with fluid withdrawal or injection. The triaxial-deformation experiments were performed to understand better the strength and deformational behavior of granular materials and to determine the permeability and pore-volume changes that accompany deformation. A section is included in which geologic applications of the experimental results are considered. (Woodard-USGS)
W77-02021

HYDROGEOLOGY OF A CAVERNOUS LIMESTONE TERRANE AND THE HYDROCHEMICAL MECHANISMS OF ITS FORMATION, MOHAWK RIVER BASIN, NEW YORK,
Geological Survey, Albany, N. Y.
V. R. Baker.
Empire State Geogram, Vol 12, No 2, p 2-65, 1976, New York State Education Department, Albany, p 2-65, 1976. 22 fig, 5 tab, 58 ref.

Descriptors: *Groundwater movement, *Hydrogeology, *Limestones, *Karst hydrology, Sinks, Caves, Aquifer characteristics, Hydrologic data, Evaluation.
Identifiers: *Mohawk River basin(NY), Schoharie County, Albany County.

The cavernous limestone terrane of the Mohawk River basin, northern Schoharie and western Albany Counties, N.Y., consists of plateaus underlain by southward-dipping limestone. Literature search of mechanisms suggests that the hydrochemical explanation for the permeability distribution in the limestone consists of four chronologic stages: (1) Beginning of groundwater movement in a fractured carbonate aquifer, (2) increase of permeability along bedding-plane fractures and vertical joints, a result of the 'fracture-breathing' phenomenon by which the permeability of an extremely tight fracture becomes a function of pore pressure, (3) transformation by hydraulic factors and by solution kinetics of small fractures into channels that eventually become cave conduits, and (4) integration of cave conduits into an efficient karst-drainage system. Karst drainage was further modified by the Pleistocene glaciation, which plugged some caves with sediment, blocked cave resurgences, and led to artesian conditions in the downdip parts of some cave-conduit systems. (Woodard-USGS)
W77-02022

GROUND-WATER RECORDS FOR SOUTHEASTERN OKLAHOMA: PART 1--RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 7C.
W77-02024

2G. Water In Soils

LAND DISPOSAL OF LIQUID SEWAGE SLUDGE: III. THE EFFECT ON SOIL NITRATE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5D.
W77-01557

CHROMIUM AND MERCURY IN A SOIL AFTER 80 YEARS OF TREATMENT WITH URBAN SEWAGE WATER, (IN GERMAN),
For primary bibliographic entry see Field 2K.
W77-01568

PHYTOTOXIC PROPERTIES OF ANAEROBIC BACTERIA OF IRRIGATED SOILS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
For primary bibliographic entry see Field 5C.
W77-01590

SOIL WATER CONTENT AND EVAPORATION DETERMINED BY THERMAL PARAMETERS OBTAINED FROM GROUND-BASED AND REMOTE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato, S. B. Idso, J. F. Vedder, R. D. Jackson, and M. B. Blanchard.
Journal of Geophysical Research, Vol. 81, No. 9, p 1617-1620, March 20, 1976. 3 fig, 7 ref.

Descriptors: *Soil water, *Moisture content, *Remote sensing, Temperature, Soil temperature.

Evaporation, Infrared radiation, Aircraft, Soils, Measurement, Moisture, Drying, Thermal properties, Air temperature, Investigations, Irrigation, Agriculture.

Soil water contents from both smooth and rough bare soil were estimated from remotely sensed surface soil and air temperatures. An inverse relationship was found between two thermal parameters and gravimetric soil water content for Avondale loam when its water content was between air-dry and field capacity. These parameters, daily maximum minus minimum surface soil temperature and daily maximum soil minus air temperature, appeared to describe the relationship reasonably well. These two parameters also described relative soil water evaporation (actual/potential). Surface soil temperatures showed good agreement among three measurement techniques: in situ thermocouples, ground-based infrared radiation thermometer, and the thermal infrared band of an airborne multispectral scanner. (Sims-ISWS)
W77-01618

LABORATORY TESTING OF WATER-REPELLENT SOIL TREATMENTS FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 4D.
W77-01621

FIELD MAPPING SOIL CONDUCTIVITY TO DELINEATE DRYLAND SALINE SEEPS WITH FOUR-ELECTRODE TECHNIQUE,
Agricultural Research Service, Sidney, Mont.
A. D. Halvorson, and J. D. Rhoades.
Soil Science Society of America Journal, Vol. 40, No. 4, p 571-575, July-August 1976. 7 fig, 3 tab, 8 ref.

Descriptors: *Saline soils, *Conductivity, *On-site investigations, Arid lands, Salinity, Measurement, Salts, Groundwater, Seepage, Mapping, Soil water, Soils, Maps, Surveys, Soil science.
Identifiers: *Soil conductivity, *Saline seeps, Dryland salinity.

Continuing incidence of saline-seep areas in the northern Great Plains dryland soils has created a need for detecting and delineating encroaching saline seeps before plant growth is affected. This paper reported on an evaluation of the four-electrode conductivity technique for field mapping surface and subsurface soil salinity under dryland conditions. Results indicated that the four-electrode conductivity technique can be used successfully to quickly field map surface and subsurface soil salinity boundaries of existing and potential saline-seep areas. This technique also depicted underground flow patterns of a shallow, saline groundwater table. Maps of apparent bulk soil conductivity values were used to locate the position of the recharge area in relation to the discharge (seep) area. While maps of discrete depth interval conductivity values provided more precise information, the time required may not warrant the additional required calculations unless a portable programmable calculator is available. Mapping soil salinity with the four-electrode conductivity technique was easy, rapid, and relatively inexpensive. This technique provides information useful in making management decisions to prevent or alleviate a saline seep or other soil salinity problems. (Sims-ISWS)
W77-01622

ANALYTICAL SOLUTIONS OF A SIMPLIFIED FLOW EQUATION,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
P. A. C. Raats.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 4, p 683-689, July-August, 1976. 6 fig, 35 ref.

Descriptors: *Infiltration, *Soil water movement, *Hydraulic conductivity, *Moisture content, *Analytical techniques, Pressure head, Hydraulics, Soil physics, Model studies, Flow, Capillary action, Equations.
Identifiers: *Separation of variables, Damping factors, Perturbations.

Assuming that the hydraulic conductivity is an exponential function of the pressure head, a simplified flow equation was derived. The influence of hysteresis was ignored. The flow equation contained a constant that can be interpreted as a natural length of the soil and a function that delimits a natural time. Solutions of three special forms of the flow equation were discussed: (1) steady flows from point and line sources and to points and line sinks, (2) steady vertical flow, subject to distributed uptake by plant roots and a water table, and (3) transient redistribution following irrigation. All solutions presented hinge upon the exponential relationship between the hydraulic conductivity and the pressure head. The relationship was believed to be valid if the range of hydraulic conductivities is small. (Singh-ISWS)
W77-01624

PREDICTION OF INFILTRATION INTO LAYERED FIELD SOILS IN RELATION TO PROFILE CHARACTERISTICS,
Agricultural Research Service, Watkinsville, Ga.
R. R. Bruce, A. W. Thomas, and F. D. Whisler.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 4, p 693-698, 703, July-August 1976. 12 fig, 4 tab, 15 ref.

Descriptors: *Infiltration, *Soil profiles, *Soil classification, *Storms, *Soil horizons, *Pressure head, Soil moisture, Hydraulics, Porosity, Numerical analysis, Soil physics, On-site tests, *Forecasting.
Identifiers: *Layered soils, Grassy plots, B2 horizon.

An infiltration model based on flow theory was used to examine the effects of nature and extent of soil horizons in profiles of a clayey soil upon infiltration and soil water distribution. It was concluded that the characteristics and thickness of the surface soil horizon which overlies a subsoil of higher clay content and lower saturated hydraulic conductivity determine infiltration and consequent distribution of soil water during a significant period of a rainfall event. The period may vary from 10 to 40 minutes for high-intensity storms, depending upon initial soil water content, and for a longer period for dry soils and low-intensity storms. The B2 horizon of the soil tested begins to regulate infiltration after 30 to 40 minutes. The duration of these periods assumes insignificant effect of raindrop impact or wetting upon the surface hydraulic characteristics. The model adequately described infiltration into a grass covered plot. (Singh-ISWS)
W77-01625

OBSERVATIONS ON THE DISTRIBUTION OF CALCIUM CARBONATE IN THE SOIL AND GROUND WATERS, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
For primary bibliographic entry see Field 2K.
W77-01733

SOIL MOISTURE AND IRRIGATION STUDIES, II. PROCEEDINGS OF A PANEL.
Vienna, Austria, Nov. 2-6, 1970. 189 p. Brigitte Kaufmann, (Ed.). International Atomic Energy Agency: Vienna, Austria; (Dist. in U.S.A. by Unipub, Inc.: New York, N.Y.). 1973. Paper. Pr. $7.50.

Descriptors: *Crop production, *Soil-water-plant relationships, *Soil moisture, *Tracer techniques, *Crop response, Moisture content, Water utilization, Soil water movement, *Irrigation, Solutes, Isotope studies, Radiation, Water balance.
Identifiers: *Radiation techniques, Radiation equipment design.

Isotope and radiation techniques for increasing crop production leading to a better understanding of soil-water-plant relationships are examined. Progress in the design of relevant radiation equipment and the advantages and limitations of using such equipment in soil moisture and irrigation studies are discussed. The use of tracer techniques in the essential studies of water and solute movement under field conditions is described. Water balance in the field and plant response to irrigation, and the role that nuclear techniques can play in such investigations, are considered. Other topics include moisture measurement in thin soil layers, analysis of soil water and solute movement under field conditions and factors influencing the interpretation of soil-water-solute interactions, and field water balance and water use efficiency.--Copyright 1974, Biological Abstracts, Inc.
W77-01735

PORE PRESSURES NEAR MOVING UNDERWATER SLOPE,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 8D.
W77-01879

PHYTOSOCIOLOGIC STUDY OF MANGROVES OF TULEAR REGION (MADAGASCAR). 4. PEDOLOGIC COMPLEMENTS RELATIVE TO MANGROVES OF SONGORITELO AND OF SAINT-AUGUSTIN, (IN FRENCH),
Aix-Marseille-1 Univ. (France). Laboratoire de Phytosociologie Cartographique.
For primary bibliographic entry see Field 2H.
W77-01888

CO2 COMPENSATION POINT FOR PHOTOSYNTHESIS: EFFECT OF VARIABLE CO2 AND SOIL MOISTURE LEVELS,
Redlands Univ., Calif. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W77-01899

EFFECT OF SOIL MOISTURE ON NODULATION OF COWPEA AND HYACINTH BEAN,
Khartoum Univ., (Sudan). Faculty of Agriculture.
For primary bibliographic entry see Field 2I.
W77-01902

SOIL MOISTURE SURVEY EXPERIMENT AT PHOENIX, ARIZONA,
EG and G, Inc., Las Vegas, Nev. Las Vegas Area Operations.
E. L. Feimster, A. E. Fritzsche, and C. Jupiter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 122, Price codes: A03 in paper copy, A01 in microfiche.
Report EGG-1183-1674, November 1975. 34 p, 6 fig, 6 tab, 1 append.

Descriptors: *Soil moisture, *Surveys, *Nuclear moisture meters, *Arizona, Aircraft, Remote sensing, Radiation, Gamma rays, Measurement, Equipment, Data collections, Data processing, Sampling.
Identifiers: *Phoenix(Ariz).

An aerial survey employing the measurement of natural terrestrial gamma radiation was carried out over farm lands east of Phoenix, Arizona, on March 18, 1975 by EG and G, Incorporated. The purpose of the survey was to determine soil moisture by detecting differences in the terrestrial gamma flux attenuation as a function of soil moisture content. The average soil moisture value for the 16-mile long survey line 1, derived from these aerial measurements was 21.5%, in good agreement with results from ground-based soil

sampling of 21.56%. Mile-by-mile averages of the aerial data ranged from 16.6% to 32.2%. This survey was carried out in order to offer an independent method of validating soil moisture data derived from aerial microwave and infrared measurements performed by the National Aeronautics and Space Administration. (Sims-ISWS)
W77-01914

SOIL MOISTURE IN THE BLACK RIVER BASIN, NEW YORK, DURING 1972-73, INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES (IFYGL),
Geological Survey, Albany, N. Y.
W. N. Embree.
Open-file report 76-543, August 1976. 33 p, 10 fig, 3 tab, 13 ref.

Descriptors: *Soil moisture, *Water storage, *Data collections, *Soil moisture meters, *New York, Hydrologic data, Snowmelt, Soil density, Porosity, Runoff, Hydrology.
Identifiers: *Black River basin(NY), International Field Year Great Lakes.

Soil-moisture data were collected and analyzed to provide an estimate of the quantity of water in temporary storage in the Black River Basin, New York, during the International Field Year for the Great Lakes (IFYGL) (April 1, 1972 to March 31, 1973). A portable neutron logger was used to record monthly soil-moisture profiles in the unsaturated zone at 11 sites in the basin. Moisture content, computed in inches of depth over the basin, ranged from 51.41 inches in April to 37.62 inches in August. Thickness of the unsaturated zone was greatest in April and was least in June. The observed absence of a pulse, or wave, of moisture moving down through the soil at most sites may be due to the infrequency of measurements, the location of sites in sandy, well-drained areas, and a relatively constant source of moisture (precipitation) at the surface. The study does not indicate a strong correlation between volume of snowmelt and soil-moisture; this may be due to the high porosity and permeability of soil material at the observation sites. Although nine pairs of monthly basin runoff and soil-moisture content data during IFYGL has a linear correlation coefficient of 0.82, too few data are available to develop a statistical relationship. (Woodard-USGS)
W77-02023

ARKANSAS RIVER WATER QUALITY RELATED TO THE IRRIGATION POTENTIAL OF ASSOCIATED SOILS,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-02065

2H. Lakes

VERTICAL DISTRIBUTION OF STRONTIUM-90 AND CESIUM-137 IN BOTTOM DEPOSITS OF RIVERS AND LAKES, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W77-01560

ALGAE OF THE LAKE CHAD REGION: I. GENERAL CHARACTERISTICS OF THE ENVIRONMENT, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.
A. Iltis, and P. Compere.
Cah O R S T O M Ser Hydrobiol 8(3/4), p 141-164, 1974.

Descriptors: *Algae, *Lakes, Africa, Water chemistry, *Lake morphology, *Lake morphometry, Climates, Limnology, Water temperature, *Lake stages, Water levels.
Identifiers: Cameroons, Chad, Lake Niger, *Lake Chad.

A botanical study of lake Chad and its neighborhood was made by a team of the Jardin Botanique National de Belgique with the Office de la Recherche Scientifique et Technique Outre-Mer of Paris. The different diotopes of the lake, particularly in the eastern part, were studied. Lake Chad extends between 12 10'N and 13 and 15 30'E; during this study the lake area oscillated between 20,000-24000 km2. Various biotopes are included: free-waters, archipelago, 'Ilots-bancs' and swamps. The area id divided between Cameroons, Nigeria, Niger, Chad. The climate is subdesertic with a long dry season alternating with a rainy season of about 4 mo. The yearly average rainfall is about 330 mm on the lake. The water level undergoes variation in connection with the water supplied of the main tributary, the river Chari, and interannual variations may widely modify the area. The lake is shallow with an average depth of about 3.5 m. Water temperatures show 2 maxima, the 1st in June, the 2nd in Sept.; a slight minimum appears in Aug. during the rainy season and a 2nd, more important minimum, in Jan. The yearly average temperature is 27C. Transparency exceeded 1 m only in the terminal creeks of the archipelago and in zones where submerged vegetation was abundant. Conductivity varied from 60 micro m hos/cm in the delta of Chari to 800 micro m hos in the northern part of the lake, the isohalines curves are concentric to the delta. The measured pH ranged from 7.2-9.1. Water chemistry is dominated by CO3(H, SO4 and Cl being found in very small quantities. Four types of water are delimited in the lake by their cationic composition. The bottom is composed of mud, clay and said, vegetal detritus is often very abundant.--Copyright 1976, Biologial Abstract, Inc.
W77-01565

ASSESSMENT OF CADMIUM IN FISHES FROM CARINTHIAN LAKES, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W77-01593

CHARACTER OF INTERRELATIONS BETWEEN CHIRONOMIDAE AND THEIR PARASITES, MERMITHIDAE, (IN RUSSIAN),
Akademiya Nauk Moldavskoi SSR, Kishinev.
For primary bibliographic entry see Field 5C.
W77-01596

DYNAMICS OF THE PARASITE FAUNA OF DIFFERENT FORMS OF SALVELINUS ALPINUS L. FROM THE BASIN OF LAKE AZABACHJE, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.
T. E. Butorina.
Parazitol (Leningr) 9(3), p 237-246, 1975.

Descriptors: *Animal parasites, Invertebrates, Aquatic animals, Nematodes, Trematodes, Protozoa, Lakes, Mollusks, Fish, Worms, Copepods.
Identifiers: Acanthocephala, Cestoda, Myxosporidia, Salvelinus-alpinus, Sarcodina, Sporozoa, USSR, *Chars, Lake Azabachje basin(USSR).

Age changes in the parasite fauna of different intraspecific forms of chars (S. alpinus) are discussed. The fauna include Sarcodina, Sporozoa, Ciliata, Trematoda, Cestoda, Nematoda, Acanthocephala, Mollsuca, and Copepoda. This year brood and yearlings of predatory, benthofagous, stream and anadromous chars up to 10 cm in length have a similar parasite fauna. During the second year of life the chars feed differently: their parasite fauna changes. Two groups of parasites are distinguished, infection with which increases and decreases with the age of fishes. Life cycles, development and maturation of some parasites of chars were studied. A shift in the developmental periods of helminths is noted as compared to those from the European part of the USSR.
W77-01597

CHLOROPHYLL DEGRADATION PRODUCT IN SEDIMENTS OF LAKE TEGA-NUMA, (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W77-01604

THE MINERALOGY AND GEOCHEMISTRY OF THE SEDIMENTS OF NORTHWESTERN LAKE VICTORIA,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-01630

SOME CONSIDERATIONS ON THE ESTABLISHMENT OF THE HIGH AND LOW WATER LEVEL PLANES IN THE GREAT LAKES AREA,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
P-A. Bolduc
Manuscript Report Series No. 38, 1975. 44 p, 1 fig, 8 tab, 4 ref.

Descriptors: *Great Lakes Region, *Great Lakes, *Lake stages, *Lake Ontario, *High water mark, *Low water mark, Water levels, Statistical methods, Monthly, Management, Regulation, Mathematical studies, Statistics, *Distribution patterns.
Identifiers: *Water level data, High water planes, Low water planes, Recording gages, Statistical studies.

Cumulative frequency distributions were used to determine the extreme and mean, maximum and minimum levels for Port Arthur, Goderich, Port Colborne, and Kingston. Daily means and the monthly maximums and minimums were processed in two groups: from 1916 to 1970, and from 1960 to 1970. For each of these periods and types of data, 6 different levels were determined from the non-exceedance percentages (5% and 95%, 3% and 97%, 1% and 99%). The monthly mean levels on each of the four Great Lakes were then used in the same fashion, and results were compared with the data obtained using the flood routing technique. The influence of the regulation on Lake Ontario was shown. Finally, a technique was proposed to derive synthetic cumulative frequency distribution curves. (Roberts-ISWS)
W77-01637

COMPARATIVE HYDROECOLOGICAL AND ZOOLOGICAL INVESTIGATIONS IN SOME SUBMERGED PLANT STANDS OF LAKE VELENCE, (IN GERMAN),
Eotvos Lorand Univ., Budapest (Hungary). Inst. of Tiersystem.
S. Andrikovics.
Opusc Zool (Budap). 12(1/2), p 21-32, 1972.

Descriptors: *Water temperature, *Dissolved oxygen, *Fluctuations, *Hydrogen-ion concentration, *Correlation analysis, *Animal populations, Summer, Oxygen demand, Lakes, Diurnal, Aquatic microorganisms, *Submerged plants.
Identifiers: Chara sp, Cladophora fracta, Hungary, Myriophyllum spicatum, Potamogeton pectinatus, Utricularia vulgaris, *Lake Velence(Hungary).

The fluctuation of temperature, dissolved O2 and pH of 5 submerged stands in Lake Velence (Hungary) are described on the basis of daily collections made in summer. Meso- and macrofauna organisms (61) are recorded from the lake. The animal aggregation of the greatest number of species populates the habitat of Utricularia vulgaris, then, in a decreasing sequence, stands of Chara sp., Potamogeton pectinatus, Cladophora fracta and Myriophyllum spicatum. The greatest numbe

of individuals occurred in the habitats of M. spicatum and P. pectinatus, followed by U. vulgaris, Chara sp. and C. fracta. Correlations between some dominant organisms and the daily phase fluctuation of dissolved O2 are shown.--Copyright 1975, Biological Abstracts, Inc.
W77-01658

PROCEEDINGS OF THE NATIONAL WETLAND CLASSIFICATION AND INVENTORY WORKSHOP, 1975.
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
For primary bibliographic entry see Field 4A.
W77-01682

RESEARCH NEEDS FOR THE LAKE TAHOE BASIN,
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, Calif.
For primary bibliographic entry see Field 6G.
W77-01693

CERTAIN CHARACTERISTIC FEATURES OF FLOWERING AND POLLINATION IN DUCKWEEDS (LEMNACEAE S. GRAY),
For primary bibliographic entry see Field 4A.
W77-01778

ENVIRONMENTAL ASPECTS OF A LARGE TROPICAL RESERVOIR - A CASE STUDY OF VOLTA LAKE, GHANA.
Smithsonian Institution, Washington, D. C. Office of International and Environmental Programs.
For primary bibliographic entry see Field 5C.
W77-01779

WATER POLLUTION INVESTIGATION: ASHTABULA AREA,
Calspan Corp., Buffalo, N. Y.
For primary bibliographic entry see Field 5C.
W77-01780

NATIONAL EUTROPHICATION SURVEY METHODS 1973-1976.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
For primary bibliographic entry see Field 5A.
W77-01787

NATIONAL EUTROPHICATION SURVEY: DATA ACQUISITION AND LABORATORY ANALYSIS SYSTEM FOR LAKE SAMPLES,
Environmental Monitoring and Support Lab., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W77-01788

PRE-IMPOUNDMENT BIOLOGICAL SURVEY OF STOCKTON RESERVOIR-SAC RIVER, MISSOURI, AUGUST 1968,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Field Investigations Branch.
For primary bibliographic entry see Field 5C.
W77-01793

BIOLOGICAL INVESTIGATIONS OF TUTTLE CREEK RESERVOIR, KANSAS,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Field Investigations Branch.
For primary bibliographic entry see Field 5C.
W77-01794

LIMNOLOGICAL STUDIES OF FLATHEAD LAKE, MONTANA: A STATUS REPORT,
Montana Univ., Missoula. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01796

CHLOROPHYLL-A AND PRIMARY PRODUCTION IN GEORGIAN BAY, NORTH CHANNEL, AND LAKE HURON, APR. TO DEC. 1974,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01798

SEASONAL ABUNDANCE AND HORIZONTAL DISTRIBUTION OF PLANKTONIC CRUSTEACEA OF GEORGIAN BAY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01799

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF GEORGIAN BAY AND NORTH CHANNEL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01800

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01801

1975 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Northern Ireland Dept. of Agricultural, Antrim.
For primary bibliographic entry see Field 5C.
W77-01804

CHEMISTRY OF NEARSHORE SURFICIAL SEDIMENTS FROM SOUTHEASTERN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W77-01805

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA--LAKE ERIE. VOL. II - THE FISHES OF THE CLEVELAND METROPOLITAN AREA INCLUDING THE LAKE ERIE SHORELINE,
John Carroll Univ., Cleveland, Ohio. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01807

RECREATIONAL REUSE OF MUNCIPAL WASTEWATER -- PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5D.
W77-01824

PHYTOSOCIOLOGIC STUDY OF MANGROVES OF TULEAR REGION (MADAGASCAR). 4. PEDOLOGIC COMPLEMENTS RELATIVE TO MANGROVES OF SONGORITELO AND OF SAINT-AUGUSTIN, (IN FRENCH),
Aix-Marseille-1 Univ. (France). Laboratoire de Phytosociologie Cartographique.
H. Weiss.
Tethys. 5(2/3), p 493-510, 1973.

Descriptors: *Soil analysis, *Connate water, *Vegetation effects, *Mangrove swamps, *Freshwater, *Groundwater, Brackish water, Surface-groundwater relationships, Potassium, Ions, Cations, Anions, Leaching.
Identifiers: Madagascar, Malagasy-republic, Songoritelo, St-Augustin, *Phytosociologic study, Tulear region.

Soil and interstitial water analyses were performed in relation to vegetation change. In spite of diverse results, common in brackish water, a relationship is shown between the development of the mangroves at Songoritelo and surface overflow of underground freshwaters. These waters are particularly rich in K+ and CO3H-. At St. Augustin, leaching of the soil seems to initiate evolution towards a soloth type.--Copyright 1975, Biological Abstracts, Inc. (See also W75-00443 and W73-13632)
W77-01888

LAKE SUPERIOR BATHYTHERMOGRAPH DATA,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
G. A. Leshkevich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 826, Price codes: A05 in paper copy, A01 in microfiche. Report NOAA TM ERL GLERL-3, June 1975. 74 p, 3 fig, 2 tab.

Descriptors: *Lake Superior, *Water temperature, *Great Lakes, *Bathythermographs, On-site investigations, Lakes, Temperature, Sampling, Surveys, Ships, Winter, Equipment, Data processing, Data collections, Limnology, Data collections.

Water temperature profiles for a longitudinal cross section of Lake Superior were collected aboard vessels operated by the United States Steel Corporation during the 1972-73 and 1973-74 winter seasons. Seven cruises were made during this period, four during the first winter season and three during the second. This information was collected as part of the Great Lakes Environmental Research Laboratory's participation in the program to examine the feasibility of an extended navigation season on the Great Lakes and the St. Lawrence Seaway. The temperature profiles were made with a portable, expendable bathythermograph system and were taken at 30-minute to 1-hour intervals, resulting in 24 to 45 measurements per cruise. Temperature profile data from the surface to a maximum depth of 200 m (656.16 ft) were presented in tabular form for each cast. (Sims-ISWS)
W77-01912

DIFFERENTIAL-HEAD--LAKE-LEVEL RELATIONSHIPS IN THE MIDDLE-GULF AREA, FLORIDA,
Water and Air Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 4B.
W77-01922

PROBABILITY DISTRIBUTION OF CONCENTRATIONS MEASURED IN THE WAKE OF A CONTINUOUS POINT SOURCE IN COASTAL CURRENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
A. El-Shaarawi, and C. R. Murthy.
Journal of Physical Oceanography, Vol. 6, No. 5, p 735-740, September 1976. 6 fig, 3 tab, 8 ref.

Descriptors: *Model studies, *Currents(Water), *Dye concentrations, Coasts, Mathematical models, Statistical models, Distribution patterns, Waste disposal, Effluents, Turbulence, Lakes, Oceans, Flow, Limnology, Oceanography, *Lake Ontario.
Identifiers: *Coastal currents, Plumes.

A generalized statistical model was proposed to determine the probability density function of the concentration history measured at a fixed point in the wake of a continuous point source in coastal

currents. An application of the model using the experimental data indicated that the log-normal distribution is adequate from many practical problems. Some general statistical characteristics of the concentration field were computed from the model. (Sims-ISWS)
W77-01927

POSSIBILITIES FOR THE SYSTEMATIC ORGANIZATION OF AQUATIC BIRD HABITATS, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W77-01950

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, GREAT LAKES-LAKE ERIE, (VOLUMES 1, 2, AND 3).
Dalton-Dalton-Little-Newport, Inc., Cleveland, Ohio.
For primary bibliographic entry see Field 5G.
W77-01979

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIPPI RIVER BASIN--VOLUME 1. LOWER MISSISSIPPI RIVER BASIN EXCEPT ARKANSAS RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-02009

NITROGEN AND PHOSPHORUS UPTAKE IN THE EVERGLADES CONSERVATION AREAS, FLORIDA, WITH SPECIAL REFERENCE TO THE EFFECTS OF BACKPUMPING RUNOFF,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-02012

CHEMICAL AND BIOLOGICAL QUALITY OF WATER IN PART OF THE EVERGLADES, SOUTHEASTERN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-02013

KINETICS OF SILICON-LIMITED GROWTH IN THE FRESHWATER DIATOM ASTERIONELLA FORMOSA,
Michigan Univ., Ann Arbor. Div. of Biology.
For primary bibliographic entry see Field 5C.
W77-02035

STATEMENT OF CONCERNS OF THE LAKE MICHIGAN TOXIC SUBSTANCES COMMITTEE RELATED TO POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Chicago, Ill.
For primary bibliographic entry see Field 5C.
W77-02038

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W77-02041

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W77-02042

FOOD SELECTION AND FEEDING RELATIONSHIPS OF YELLOW PERCH (PERCA FLAVESCENS MITCHELL), WHITE BASS (MONONE CHRYSOPS (RAFINESQUE)), FRESHWATER DRUM (APLODINOTUS GRUNNIENS (RAFINESQUE)), AND GOLDFISH (CARASSIUS AURATUS (LINNEAUS)), IN WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-02043

2I. Water In Plants

ROOT SYSTEM OF THE PEAR IN ARID ZONES, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Basis Agriculture.
I. M. Vashchenko.
Biol Nauki (Mosc) 18(6), p 60-64, 1975.

Descriptors: *Arid lands, *Root systems, Loam, Fruit crops, Orchards, Soils, Soil types.
Identifiers: Anthropogenic factor, Edaphic factors, *Pear, Root biomass, USSR, *Lower Don River area(USSR).

The root system of pears on the eroded and buried steppe loamy-sand soils of the Lower Don (USSR) was studied. The plasticity of the root system to edaphic and anthropogenic factors are most pronounced. A change of ecological conditions leads to a change of the spatial arrangement of the roots and their biomass. In arid steppes the bulk of the roots is concentrated in the 40-120 cm layer.
W77-01595

THE MOVEMENT OF SNOW-WATER THROUGH SMALL PLANT-SOIL SYSTEMS IN THE MEDICINE BOW MOUNTAINS, WYOMING,
Wyoming Univ., Laramie. Dept. of Botany.
For primary bibliographic entry see Field 2D.
W77-01812

SOME MOLECULAR MECHANISMS RETAINING WATER IN PLANT CELLS, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
A. A. Fedorova, and N. V. Sedykh.
S-Kh Biol 10(3), p 364-369, 1975.

Descriptors: *Systematics, Soybeans, Corn(Field), Beans, Peas, *Water availability, Water loss, *Moisture deficit, *Moisture uptake, *Dehydration, *Crops, Plant physiology.
Identifiers: Chick-pea, Millet, Plasmalemma.

The effect of the condition of intracellular water and plasmalemma on water-holding ability of soybean, millet, corn, pea vine, chick, pea and beans at normal water availability and water defiency was studied. The condition of intracellular water and plasmalemma affected water-holding ability of plants, the effect being different at different stages of dehydration.--Copyright 1976, Biological Abstracts, Inc.
W77-01881

CHANGES IN NITROGEN CONTENT IN PERENTIAL FORAGE GRASSES IN DIFFERENT GRASS MIXTURES, (IN AZERBAIJANI),
For primary bibliographic entry see Field 3F.
W77-01886

CO2 COMPENSATION POINT FOR PHOTOSYNTHESIS: EFFECT OF VARIABLE CO2 AND SOIL MOISTURE LEVELS,
Redlands Univ., Calif. Dept. of Biology.
P. Hurt, and R. Wright.
The American Midland Naturalist, Vol. 95, No. 2., p 450-455, April, 1976, 2 fig, 9 ref.

Descriptors: *Carbon dioxide, *Soil moisture, *Pine trees, *Moisture stress, *Photosynthesis, Light, Oxygen demand, Vegetation, Soil-water-plant relationships, Moisture content, Arid climates, Tension, Temperature.

Net photosynthesis of two species of pine seedlings was determined by carbon dioxide analysis under limiting conditions of soil moisture and carbon dioxide. It is known that soil moisture stress can have a detrimental effect on photosynthetic rates. Laboratory tests were conducted to examine increasing carbon dioxide levels and soil moisture tension to see how increased levels of carbon dioxide might effect the carbon dioxide compensation points of pine seedlings at certain water stresses. As the carbon dioxide limiting factor was removed by enhancement of atmospheric carbon dioxide, net photosynthesis increased even when soil water potential was low. Atmospheric carbon dioxide increase of considerable magnitude is a virtual certainty in coming years. Net photosynthesis of vegetation in dry climates will respond to this increase. (Jamail-Arizona)
W77-01899

RAINFALL INTERCEPTION BY COOL-DESERT SHRUBS,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 3B.
W77-01900

EFFECT OF SOIL MOISTURE ON NODULATION OF COWPEA AND HYACINTH BEAN,
Khartoum Univ., (Sudan). Faculty of Agriculture.
H. A. Habish, and A. A. Mahdi.
Journal of Agricultural Science, Vol 86, No. 3, p 553-560, June, 1976. 6 fig, 4 tab, 13 ref.

Descriptors: *Soil moisture, *Plant growth, *Legumes, *Beans, *Nitrogen fixation, Subtropic, Moisture content, Field capacity, Irrigation, Irrigation efficiency, Crops, Moisture deficit, Arid lands, Africa.
Identifiers: *Nodulation, *Cowpeas, *Sudan, *Hyacinth beans.

The effect of soil moisture on nodulation and growth of cowpea and hyacinth bean was investigated in pot and field experiments conducted in Sudan. Greenhouse experiments showed greater numbers of nodules at all levels of soil moisture in summer than in winter. The number and dry weight of cowpea and hyacinth bean were similarly affected by soil moisture. Poor nodulation of both crops at 15 percent soil moisture suggests that moisture is likely to limit nodulation of these legumes in the lighter soils of the rainlands where dryness occurs immediately after the end of the rainy season. Cowpea required less moisture than hyacinth bean for optimum nodulation and was thus more adapted to drier conditions. Experiments with irrigation showed that irrigating every 7 days gave better nodulation than irrigating every 14 days. This was attributed to the dry conditions which prevailed towards the end of the long watering interval. (Jamail-Arizona)
W77-01902

ABSCISIC ACID LEVEL IN TOMATO LEAVES AFTER A LONG PERIOD OF WILTING,
Aarhus Univ., (Denmark). Inst. of Plant Physiology.
O. S. Rasmussen.
Physiologia Plantarum, Vol. 36, No. 2., p 208-212, 1976. 4 fig, 3 tab, 18 ref.

Descriptors: *Moisture stress, *Soil-water-plant relationships, *Wilting point, *Water loss, *Leaves, Moisture availability, Moisture content, Transpiration, *Tomatoes, Water consumption, Acids, Gas chromatography, Plant growth, Adaptation.
Identifiers: *Abscisic acid.

The abscisic acid content was determined quantitatively in leaves from wilted and unwilted tomato plants by the use of the wheat coleoptile test and gas-liquid chromatography. Plants receiving an insufficient daily water supply for 18 days showed adaptation to wilting conditions, adjusting to added amounts of water by regulating water loss through transpiration. The concentration of abscisic acid was not higher in the leaves of plants adapted to water stress than in plants that were watered abundantly. Wilted detached leaves and leaves from rapidly wilted intact plants showed the well-known reaction by increasing the abscisic acid level. A possible role of abscisic acid in the early stages of the adptation process is discussed. (Jamail-Arizona)
W77-01906

RESPONSE OF COTTON TO NITROGEN AND WATER IN A TROPICAL ENVIRONMENT. III. FIBRE QUALITY,
Commonwealth Scientific and Industrial Research Organization, Kununurra (Australia). Div. of Land Research.
For primary bibliographic entry see Field 3F.
W77-01910

GROWTH OF CARP FRY UNDER EXPERIMENTAL CONDITIONS, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
L. A. Dobrinskaya, and T. V. Sled.
Ekologiya. 5(6), p 62-68, 1974.

Descriptors: *Growth stages, *Growth rates, *Fish, *Carp, *Fry, Size, Weight, Variability, *Fish stocking, Population, Aquaria.
Identifiers: Density, Metabolites, Fish growth.

Experiments were performed to determine the growth rate of carp fry (Cyprinus carpio) as a function of stocking density in aquaria. The 20-day-old carp fry (from 5-100) were kept in 30-l aquaria for 3 mo. The effect of metabolites excreted into the water on fry growth was studied. Three size subgroups are formed when fish of the same size and age are kept under relatively stable conditions in each aquarium. Data on th size, weight and variability of these indices are presented. The effect of metabolites is apparently one of the self-regulation mechanisms of growth, development and number of fish that can survive in the given system.--Copyright 1975, Biological Abstracts, Inc.
W77-02006

SIMULATION OF FOREST CHANGES RELATED TO HYDROLOGIC VARIABLES IN THE ATCHAFALAYA RIVER BASIN, LOUISIANA,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W77-02019

PHYTOBENTHOS OF THE TEDZHEN FISH-BREEDING FARM, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki.
Y. E. Lyubeznov.
Izv Akad Nauk Turkm SSR Ser Biol Nauk. 5 p, 28-23, 1974.

Descriptors: *Nutrients, *Nutrient requirements, *Algae, *Aquatic algae, *Fish farming, *Fish populations, Fish hatcheries, Productivity, Biomass.
Identifiers: Benthos, *Desmids, Mineral, Tedzhen, USSR, Turkmen SSR, *Phytobenthos.

The phytobenthos (algae, desmids) of 3 Tedzhen (Turkmen SSR, USSR) fish-hatcheries was investigated over a 2-yr period. The effect of fish-breeding measures on compsition and amount of fish was studied. Application of mineral nutrients increases the amount and biomass of phytobenthos 2-3 times.--Copyright 1975, Biological Abstracts, Inc.
W77-02034

QUALITATIVE AND QUANTITATIVE CHARACTERISTICS OF COMMERCIAL FISH OF THE SOLIGORSK RESERVOIR, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Dept. of Zoology and Parasitology.
T. M. Shawtsova, and A. M. Lyakh.
Vyestsi Akad Navuk BSSR Syer Biyal Navuk. 6, p 78-81, 1974.

Descriptors: *Fish, *Commercial fish, *Freshwater fish, *Fishing gear, *Fish populations, Fish harvest, Pikes, Perches, Carp.
Identifiers: *Species, Composition, Belorussian SSR, Bronze beam, Dace, Ide, Reservoir, Roach, Rudd, Ruff, Silver bream, Soligorsk, Tench, USSR.

Data are presented on the species composition (roach, pike, bronze bream, perch, carp, ruff, silver bream, ide, rudd, tench, dace) and the quantity of commercial fish in the Soligorsk Reservoir. On the basis of a 3-yr study (1971-1973) the proportion of each fish species in the catches is characterized by the year and month and the fishing gear used.--Copyright 1975, Biological Abstracts, Inc.
W77-02040

2J. Erosion and Sedimentation

VERTICAL DISTRIBUTION OF STRONTIUM-90 AND CESIUM-137 IN BOTTOM DEPOSITS OF RIVERS AND LAKES, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W77-01560

STOKES SETTLING AND DISSOLUTION RATE MODEL FOR MARINE PARTICLES AS A FUNCTION OF SIZE DISTRIBUTION,
Paris Univ. (France). Laboratoire d'Oceanographie Physique.
For primary bibliographic entry see Field 2L.
W77-01616

LABORATORY TESTING OF WATER-REPELLENT SOIL TREATMENTS FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 4D.
W77-01621

SEDIMENTARY MODEL FOR INTERTIDAL MUDFLAT CHANNELS, WITH EXAMPLES FROM THE SOLWAY FIRTH, SCOTLAND,
Leeds Univ. (England). Dept. of Earth Sciences; and Leeds Univ. (England). Div. of Geology.
For primary bibliographic entry see Field 2L.
W77-01629

THE MINERALOGY AND GEOCHEMISTRY OF THE SEDIMENTS OF NORTHWESTERN LAKE VICTORIA,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Geology.
J. S. Mothersill.
Sedimentology, Vol. 23, No. 4, p 553-565, August 1976. 5 fig, 3 tab, 29 ref.

Descriptors: *Africa, *Sediments, *Mineralogy, *Lakes, *Lake sediments, Geochemistry, Sands, Silts, Clays, Organic matter, Photosynthesis.
Identifiers: *Lake Victoria(Africa), Plagioclase, Kaolinite, Illite, Vermiculite, Varimax matrix determinations.

In the nearshore area of northwestern Lake Victoria, a thin strip of quartzarenite sand occurs which grades lakeward into silty clay consisting of quartz with subordinate amounts of K-feldspar, plagioclase, kaolinite, illite, vermiculite, and organic matter. Varimax matrix determinations of the element concentrations in the lake-bottom sediments extractable by aqua regia indicated that: (1) there is a strong association of Cr, Cu, Zn and Ni; (2) there is a strong association of Fe, Mn, and Co; (3) Cu and Ni show moderate to slight associations with organic matter; and (4) Ca is relatively independent of the other elements. It was learned that the general decrease in the pH values of the surface and bottom waters outward from the lake shore, with consistently higher values for the surface water relative to the bottom waters, results from decreasing levels of photosynthetic ctivity. (Lee-ISWS)
W77-01630

IMPACT OF WATER RESOURCE DEVELOPMENT ON COASTAL EROSION, BRAZOS RIVER, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-01681

USE OF OUTER BARS OF INLETS AS SOURCES OF BEACH NOURISHMENT MATERIAL,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W77-01708

CHEMISTRY OF NEARSHORE SURFICIAL SEDIMENTS FROM SOUTHEASTERN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W77-01805

A STOCHASTIC SEDIMENT YIELD MODEL FOR BAYESIAN DECISION ANALYSIS APPLIED TO MULTIPURPOSE RESERVOIR DESIGN,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 4D.
W77-01892

DUST STORMS,
For primary bibliographic entry see Field 2B.
W77-01895

RAINFALL EROSIVITY OVER RHODESIA.
Rhodesia Univ., Salisbury. Dept. of Geography.
M. A. Stocking, and H. A. Elwell.
Transactions, Institute of British Geographers, Vol. 1, No. 2., p 231-245, 1976. 9 fig, 4 tab, 22 ref.

Descriptors: *Soil erosion, *Storm runoff, *Storm water, *Rainfall, *Rainfall-runoff relationships, Precipitation(Atmospheric), Vegetation effects, Erosion, Rain, Surface runoff, Storms, Impact(Rainfall), Subtropic, Air-earth interfaces, Soil types, Kinetics, Energy, Africa.
Identifiers: *Erosivity, *Rhodesia.

The erosive potential of rainfall, 'erosivity', is discussed. Using bare soil as a standard, a measure linking kinetic energy and a maximum sustained intensity is found to be the most generally applicable erosivity parameter over Rhodesia. This is consistent with American findings. Data for 8000 storms show that erosivity varies much more widely between years than mean annual rainfall and that on a yearly basis there is no relationship between the two. Of more significance to the ero-

sion process is the finding that many stations, especially in the lower rainfall areas, have a higher proportion of erosive storms in the early rainy season when vegetation cover is poor. A relationship is established between long-term mean annual rainfall and erosivity which is used to construct a composite erosivity map of Rhodesia for the use of conservation planners and as an extension aid. (Jamail-Arizona)
W77-01901

CALCIUM CARBONATE DISTRIBUTION IN THE SURFACE SEDIMENTS OF THE INDIAN OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W77-01919

HYDRAULIC PERFORMANCE OF FLUMES FOR MEASUREMENT OF SEDIMENT-LADEN FLASH FLOODS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W77-01935

EQUILIBRIUM CONDITIONS AND SEDIMENT TRANSPORT IN AN EPHEMERAL MOUNTAIN STREAM,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
B. H. Heede.
In: Volume 6. Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1976 Annual Meeting of Arizona Section, AWRA and the Hydrology Section, AAS (April 28-May 1), Tucson, Arizona. p 97-102, 3 fig, 3 ref.

Descriptors: *Geomorphology, *Channel morphology, *Equilibrium, *Sedimentation, *Arizona, *Sediment transport.
Identifiers: Mountain streams, Bed form, Gravel bars, Hydraulic geometry, Flow frequency.

Flow frequency curves supported the hypothesis that channel-forming flows are exceptional events in ephemeral mountain streams. This was substantiated by the lack of a relationship between sediment production and sediment yield. Numerous bed nickpoints indicated channel instability, despite gravel bars and log steps that are part of the slope adjustment processes. Due to differences in structural density between bars and steps, size distribution of the sediment deposits above them differs. Although only qualitative guidelines are presented, the watershed or wildlife manager should be in a position to utilize the formation of gravel bars and log steps for management goals. (Forest Service)
W77-01951

SOUTHEASTERN FORESTS AND THE PROBLEM OF NON-POINT SOURCES OF WATER POLLUTION,
Forest Service (USDA), Franklin, N. C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W77-01952

2K. Chemical Processes

SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF ADSORBED WATER PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
For primary bibliographic entry see Field 5A.
W77-01563

SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF WATER ADSORBATE PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
For primary bibliographic entry see Field 5A.
W77-01564

CHROMIUM AND MERCURY IN A SOIL AFTER 80 YEARS OF TREATMENT WITH URBAN SEWAGE WATER, (IN GERMAN),
N. El-Bassam, P. Poelstra, and M. J. Frissel.
Z Pflanzenernaehr Bodenkd 3, p 309-316, 1975.

Descriptors: *Chromium, *Mercury, Soil analysis, *Soil treatment, *Sewage, Municipal wastes, Adsorption, Groundwater, Anaerobic conditions, Water pollution.

A soil irrigated with sewage water for 80 yr contains 112 ppm Cr and 1.5 ppm Hg. The sewage water presently contains 0.07 ppm Cr and 0.002 ppm Hg. To study the migration and leaching of Cr in the soil experiments were done with 51 Cr as Cr3- under anaerobic conditions in undisturbed soil columns. In all cases Cr was adsorbed in the layer 0-5 cm. Similar experiments with 203 Hg as HgCl2 showed that Hg is adsorbed near the surface. Neither Cr nor Hg contaminated the ground water.
W77-01568

HYDROCHEMISTRY AND GROUND-WATER MIXING IN PART OF THE LINCOLNSHIRE LIMESTONE AQUIFER, ENGLAND,
Birmingham Univ. (England). Dept. of Geological Sciences; and Birmingham Univ. (England). Hydrogeology Section.
For primary bibliographic entry see Field 2F.
W77-01627

HYDROLOGY AND CHEMISTRY OF GROUND WATER IN PUNA, HAWAII,
Colorado School of Mines, Golden. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-01628

PERFORMANCE CHARACTERISTICS FOR THE SPECTROPHOTOMETRIC DETERMINATION OF TOTAL IRON IN FRESHWATER USING HYDROCHLORIC ACID,
Freshwater Biological Association, Windermere (England).
For primary bibliographic entry see Field 5A.
W77-01642

ANNUAL BOOK OF ASTM STANDARDS. PART 31: WATER,
For primary bibliographic entry see Field 5A.
W77-01662

OBSERVATIONS ON THE DISTRIBUTION OF CALCIUM CARBONATE IN THE SOIL AND GROUND WATERS, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
A. Ronai.
Magy All Foldtani Intez Evi Jel., 1971, p 123-139, 1973.

Descriptors: *Groundwater, Soil water, *Calcium carbonate, Calcium compounds, *Water pollution, *Soil contamination, *Sampling, *Distribution.
Identifiers: *Hungary.

The distribution of CaCO3 in the soil, the subsoil and the ground waters shows many interesting varieties in the Alfold's lowland areas (Hungary). The territory was explored by 10m-deep boreholes located in a regular grid. The territory under consideration is the interfluve of the Tisza and Koros rivers, the region of C songrad-Tiszfoldvar. In the inter-mound depressions of the western areas of the Tisza the accumulation of CaCO3 on the surface and underground is considerable, and the longitudinal depressions are lined with fine lacustrine chalk in several places. To the east of the Tisza, the loess areas further away from the rivers are rich in lime. The CaCO3 content of the ground waters does not exhibit a distribution of this kind. The highest quantities of calcium hydrocarbonate can be found in ground waters close to the rivers while in the more remote areas this mineral is rather poor. Accordingly, the distribution pattern is almost the reverse of the conditions existing in the soil. This phenomenon seems to be due the slow, river-bound subsurface flow of the ground waters and to the large-scale evaporation occurring on the flat flood plains. A 2nd reason consists in the Ca-Na exchange between soil and ground water. The vertical distribution of CaCO3 in the soil strata is shown. The sand mounds west of the Tisza are very abundant in CaCO3 even at depths of 7 to 10 m underground. On the flood plains of the rivers to the east of the Tisza there are leached limeless soils and even in the loess areas farther away from the rivers it is only in the accumulation horizon below the top soil layer that lime is abundant. The ground waters leach the strata during the vertical oscillations of their table and they keep the dissolved salts in permanent motion. The amplitude of oscillations defines the thickness of the strata involved in leaching. The quantity of leachable salts, however, depends on the granulometric composition of the strata. Fine-grained strata (silt, clay, sand flour) contain greater amount of leachable substance, though the rate of leaching is slow. Leaching in coarse-grained sediments (sands) is rapid, though the quantity of water-soluble substances is low. The variation of the CaCO3 content of the soil and ground water and the zone of ground water oscillations are shown in 3 geological sections.--Copyright 1974, Biological Abstracts, Inc.
W77-01733

SHALLOW GROUND-WATER SALINIZATION IN DRYLAND FARM AREAS OF MONTANA,
Montana Univ., Missoula. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-01822

THE EFFECT OF THE NON-IDEAL COMPOSITION OF SEA WATER ON SALINITY AND DENSITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2L.
W77-01911

A STUDY OF MOLECULAR PARAMETERS INFLUENCING POLYMER DRAG REDUCTION,
Naval Underseas Center, San Diego, Calif.
For primary bibliographic entry see Field 8B.
W77-01915

BICARBONATE CONTENT OF GROUNDWATER IN CARBONATE ROCK IN EASTERN NORTH AMERICA,
Geological Survey, Menlo Park, Calif.; and Geological Survey, Raleigh, N. C.
F. W. Trainer, and R. C. Heath.
Journal of Hydrology, Vol 31, No 1/2, p 37-55, September 1976. 3 fig, 2 tab, 37 ref.

Descriptors: *Bicarbonates, *Groundwater, *Carbonate rocks, *Aqueous solutions, Carbon dioxide, Vegetation, Soils, Percolating water, Limestones, Karst hydrology, Hydrogeology, Water chemistry, North America, Puerto Rico.
Identifiers: *Eastern North America, Yucatan.

In carbonate-rock terrane the most effective solution occurs where soil and vegetative cover facilitate biogenic production and storage of CO2 in the soil until part of it is carried downward in percolating water. Bicarbonate data for groundwater in eastern North America are examined in

e light of these conditions, of the CO2 content of il gas, and of the timing of groundwater recharge lative to seasonal changes in soil temperature. ere appears to be no well-marked relation tween latitude and bicarbonate content of oundwater in this region. Interplay of all the fac- rs listed above, and of lithology and soil types, is idently such that under optimum conditions the nount of solution of carbonate rock is roughly mparable, per unit of groundwater recharge, er the region from Ohio to Florida (and, per- ps, to Puerto Rico and Yucatan). Relatively low CO3 concentrations observed in much of the uthern United States are attributed to low oduction and storage of CO2 in sandy soil that is or in organic matter. On the other hand, concen- tions observed in Ontario, New York and ichigan are markedly higher than is to be ex- cted from interrelations of the factors con- lered. These high values, apparently anomalous, e attributed in part to solution of granular glacial ift derived largely from carbonate rock. oodard-USGS)
77-02020

L. Estuaries

FECTS OF CADMIUM AND LEAD UPON IE INDIGENOUS HETEROTROPHIC ICROFLORA IN THE AQUEOUS ENVIRON- ENT OF THE BRACKISH ESTUARY-WATER THE RIVER WESER, (IN GERMAN),
stitut fuer Meeresforschung, Bremerhaven est Germany).
r primary bibliographic entry see Field 5C.
77-01566

UDY ON THE CHARACTERISTIC DIS- IBUTION OF PHOSPHATE IN JUNHAE Y, (IN KOREAN),
san Fisheries Coll. (Republic of Korea).
r primary bibliographic entry see Field 5B.
77-01571

ATER QUALITY OF THE CULTURE BEDS HARD CLAM AND ADJACENT SEA OF IE YEOSU REFINERY OF HONAM OIL FINERY COMPANY IN KWANG YANG Y, (IN KOREAN),
san Fisheries Coll. (Republic of Korea).
r primary bibliographic entry see Field 5C.
77-01572

RFACE WATER POLLUTION-THE TCHMENT AREA AT SANDEFJORD, (IN RWEGIAN),
rsk Institutt for Vannforskning, Blindern.
r primary bibliographic entry see Field 5B.
77-01587

YTOPLANKTON DISTRIBUTION IN THE OTIA SEA AS RELATED TO VERTICAL ATER CIRCULATION, (IN RUSSIAN),
-Union Research Inst. of Marine Fisheries and eanography, Moscow (USSR).
r primary bibliographic entry see Field 5B.
77-01592

YSSAL CIRCULATION OF THE UTHEASTERN PACIFIC AND SOME OLOGICAL IMPLICATIONS,
ipps Institution of Oceanography, San Diego, if. Marine Physical Lab.
onsdale.
rnal of the Geophysical Research, Vol. 81, No. 1163-1176, February 20, 1976. 14 fig, 55 ref. F DES74-20396.

scriptors: *Circulation, *Ocean circulation, rrents(Water), *Pacific Ocean, Water circula- n, Temperature, Water temperature, Salinity, Hypolimnion, Geology, Basins, Oceans, Erosion, Sediment transport, Sediments, Mixing, Oceanography.
Identifiers: *Chile, *Peru, *Panama, *Guatemala, *Abyssal circulation, Thermohaline currents, Bottom circulation.

The abyssal circulation of the Pacific Ocean east of the East Pacific Rise was deduced from hydrographic data, supported by a few direct current measurements. Two main flow paths were recognized: across the Chile Rise into the Chile Basin, and thence northward into the Peru Basin and Panama Basin; and eastward across the East Pacific Rise into the Guatemala Basin and into Bauer Basin. The following conditions were found to exist: Transform fault troughs are important passages allowing flow across the rises, and the Peru-Chile Trench is the principal channel for inflow to the Peru and Panama basins. The deep water that flows across the East Pacific Rise near the equator has a similar temperature structure to that in the southern Chile Basin, but it is less saline and has lower oxygen concentrations. Along both flow paths the bottom waters become warmer, less saline, and less oxygenated as a result of vertical mixing (intensified near sills), geothermal heating (concentrated at active spreading centers), and in situ decay of organic matter (especially beneath productive surface waters). The regional pattern of abyssal circulation may partly control the distribution of metalliferous pelagic sediments (including both fine-grained precipitates and manganese nodules) and the rates of dissolution of calcareous sediments. Where the deep thermohaline flow is accelerated in narrow passage between basins, it has deeply eroded the sea floor and transports sediment as bed load. Steady currents measured in one of these passages exceeded 30 cm/s. (Sims-ISWS)
W77-01611

THE DENSITY OF ARTIFICIAL RIVER AND ESTUARINE WATERS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
F. J. Millero, D. Lawson, and A. Gonzalez.
Journal of Geophysical Research, Vol. 81, No. 6, p 1177-1179, February 20, 1976. 4 tab, 29 ref. ONR N00014-75-C-0173, NSF GA-40532.

Descriptors: *Estuaries, *Rivers, *Density, Mixing, Saline water-freshwater interfaces, Model studies, Mathematical models, Equations, Laboratory tests, Physical properties, Chemical properties, Dissolved solids, Coasts, Sea water, Salinity.
Identifiers: *Artificial estuaries, *Artificial rivers.

The densities of an artificial estuary formed by mixing artificial average river water with standard seawater have been measured with a vibrating densimeter at 25 C. The densimeter was calibrated by measuring the densities of weight evaporated and diluted (with pure water) standard seawater solutions. The measured seawater densities agreed with those determined from the equation of state of Millero, et al, to plus or minus 2 ppm. The densities of the artificial river waters were found to be in good agreement (4.2 ppm) with those determined by using apparent equivalent volume data for the major river components. The densities of the artificial river and the estuarine waters were found to be in excellent agreement (plus or minus 1.6 ppm) with the densities of seawater solutions (diluted with pure water) at the same total solid concentration or salinity. These results confirmed the theoretical calculations of Millero and indicated that the densities of rivers and estuaries can be determined from the equation of state of seawater diluted with pure water. (Sims-ISWS)
W77-01612

TEMPERATURE AND SALINITY MICROSTRUCTURE IN THE PACIFIC EQUATORIAL UNDERCURRENT,
Scripps Inst. of Oceanography, La Jolla, Calif.
M. C. Gregg.
Journal of Geophysical Research, Vol. 81, No. 6, p 1180-1196, February 20, 1976. 11 fig, 2 tab, 14 ref. ONR N00014-69-A-0200-6049, ONR N00017-69-0200-6039.

Descriptors: *Oceans, *Salinity, *Density, *Water temperature, *Pacific Ocean, Physical properties, On-site investigations, Temperature, Thermocline, Fluctuations, Mixing, Turbulence, Heat transfer, Oceanography.
Identifiers: *Microstructure, *Pacific equatorial undercurrent, Cox number.

In July 1972, six microstructure profiles were taken on the equator at 155 deg W. The rate of dissipation of the temperature fluctuations was high, but not exceptional. A region of intense microstructure activity was found from 35 to 65 m, well above the velocity maximum. Sharp instabilities were found with vertical scales of less than 1 m in this region. The average Cox number was greater than 3300, implying the presence of intense vertical turbulence. By comparison, the profile in the vicinity of the velocity maximum, about 110 m, had an average Cox number of about 40 and a much less active appearance, which is consistent with weak vertical turbulence. A very well developed, nearly isothermal region between 300 and 400 m, the thermostad, was found to have a Cox number of about 100 because of moderate levels of microstructure activity. The thermostad was stable over scales of 10 m but not over scales of 1 m. Below the thermostad, the mean Cox number was no more than 20, and the temperature profile had an appearance similar to that of monotonic records from other locations. The general pattern of vertical turbulence found was consistent with the 10-m-scale Richardson number values of Jones and with the values of the vertical turbulent viscosity used in a model by Robinson. (Sims-ISWS)
W77-01613

LONG-RANGE ECHO SOUNDING WITH A CHIRP SOURCE,
Woods Hole Oceanographic Institution, Mass. Dept. of Ocean Engineering.
M. H. Orr, R. C. Spindel, and R. P. Porter.
Journal of Geophysical Research, Vol. 81, No. 6, p 1197-1200, February 20, 1976. 9 fig, 8 ref. ONR N00014-70-C-0205.

Descriptors: *Remote sensing, *Oceans, *Acoustics, *Atlantic Ocean, Equipment, Instrumentation, Investigations, Sounding, Sound waves, Bathymetry, Measurement, Mapping, Sonar, Surveys, Oceanography.
Identifiers: *Echo sounding, *Blake escarpment, Chirp sources.

An experiment was performed to determine the applicability of coherent signal processing techniques to a long-range, low-frequency, side-looking bathymetric survey system. A linear FM sweep of 280-Hz center frequency, 10-Hz bandwidth, and 20-s duration was produced by a source at depths between 120 and 150 m towed parallel to the Blake escarpment at a range of about 250 km. Reflected signals were received by a line array towed at depths ranging from 765 to 825 m. The received signals were passed through a digital pulse compressor and averaged. Groups of the received signals were easily identified as reflections from the Blake escarpment. The experiment showed that coherent signal processing techniques are applicable to low-frequency, side-looking bathymetric survey systems. (Sims-ISWS)
W77-01614

VERTICAL PROFILES OF TEMPERATURE AND FINE-SCALE VELOCITY STRUCTURE IN THE THERMOCLINE,
Hawaii Univ. Honolulu. Dept. of Oceanography.
B. Gallagher.
Journal of Geophysical Research, Vol. 81, No. 6, p 1201-1206, February 20, 1976. 7 fig, 8 ref. NSF GA-1243.

Descriptors: *Water temperature, *Velocity, *Oceans, *Pacific Ocean, On-site investigations, Temperature, Measurement, Mixing, Turbulence, Fluctuations, Instrumentation, Investigations, Oceanography.
Identifiers: *Microstructure, Fine-scale velocity structure.

Temperature and fine-scale velocity structure were measured in vertical profiles extending from the sea surface down through the main thermocline near Oahu, Hawaii. From 10 to 20% of the upper water column contained small-scale velocity fluctuations, which were present in discrete vertical patches or events. The amount of activity was greatest within the thermocline. Typical velocity fluctuations within events ranged from 0.1 to 1.0 cm/s, vertical wavelengths ranging from from 5.0 to 50 cm. There was correlation between the form of the velocity flutuations and the surrounding thermal structure; larger-scale motions corresponded with higher temperature gradients. (Sims-ISWS)
W77-01615

STOKES SETTLING AND DISSOLUTION RATE MODEL FOR MARINE PARTICLES AS A FUNCTION OF SIZE DISTRIBUTION,
Paris Univ. (France). Laboratoire d'Oceanographie Physique.
J-C. Brun-Cottan.
Journal of Geophysical Research, Vol. 81, No. 9, p 1601-1606, March 20, 1976. 6 fig, 1 tab, 22 ref.

Descriptors: *Settling velocity, *Particle size, *Oceans, *Model studies, Mathematical models, Rates, Sediments, Deposition(Sediments), Suspended solids, Solubility, Physical properties, Stokes law, Sedimentation rates, Sedimentation, Oceanography.
Identifiers: *Dissolution rate, *Marine particles.

A critical analysis of a Stokes settling model for marine particles which takes into account dissolution rate, density, size distribution of the particles, and velocity of vertical advection was proposed. The dissolution rate was considered proportional to the diameter, surface area, or volume of the particles. Coefficients of the model were calculated exclusively from particle size measurements made in 1971-1972 in the western Mediterranean and the Guinea Basin with a modified Coulter counter. The variation of diameters and the settling rates of particles with depth were calculated in a defined surface water column taken between 300 and 800 m to match actual conditions. Known values of the dissolution rate of calcite particles in seawater were used to test the model coefficients. The theoretical influence of dissolution on concentration and size distribution of marine particles was evaluated. Comparison of the model values with weight and particle size data in this depth interval indicated that Stokes settling only applies to particles with sizes greater than 4-5 micrometers. (Sims-ISWS)
W77-01616

THE TIDES OF THE EAST RIVER, NEW YORK,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
M. J. Bowman.
Journal of Geophysical Research, Vol. 81, No. 9, p 1609-1616, March 20, 1976. 11 fig, 3 tab, 21 ref.

Descriptors: *Tides, *Tidal waters, *Estuaries, *New York, Circulation, Water circulation, Tidal effects, Fluctuations, Frequency, Waves(Water), Currents(Water), Hydrodynamics, Model studies, Mathematical models, On-site investigations, Rivers.
Identifiers: *East River(NY), *Long Island Sound(NY).

The East River, New York, is a co-oscillating tidal strait connecting New York Harbor to western Long Island Sound. Linear wave theory was applied to the river in an attempt to interpret the tidal characteristics. The theory accurately described the observed longitudinal variation in amplitude of the tidal current, but the simple model used did not adequately predict the amplitudes of the tidal heights or the overtides. The frictional resistance to flow through the river was characterized by an effective value of De Chezy's coefficient of approximately 26 (m to the 1/2 power)/s. Tidal current records gathered over a 5-day period from a linear array placed across the Upper East River were analyzed to investigate the harmonic content of the tidal transport. The semidiurnal frequency and its third harmonic were dominant. (Sims-ISWS)
W77-01617

CHARACTERISTICS OF A TIDE-INDUCED ESTUARINE FRONT,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
R. G. Ingram.
Journal of Geophysical Research, Vol. 81, No. 12, p 1951-1959, April 20, 1976. 11 fig, 14 ref.

Descriptors: *Tides, *Estuaries, *St. Lawrence River, *Canada, On-site investigations, Aerial photography, Rivers, Turbidity, Flow, Tidal bores, Tidal waters, Velocity, Temperature, Water temperature, Salinity, Density, Measurement.
Identifiers: *Fronts(Water).

Characteristics of a dynamic front over the Ile Rouge Bank in the Saint Lawrence estuary were discussed. It was shown that an advancing front, exhibiting both a large density gradient and a convergent surface flow, is generated during each semidiurnal tide cycle. Frontal advance occurs just after high tide on the northern shore. During retreat, frontlike characteristics were not observed. (Sims-ISWS).
W77-01619

ON POLARIZATION FEATURES OF RADIO SIGNALS SCATTERED FROM THE SEA SURFACE AT SMALL GRAZING ANGLES,
Akademiya Nauk URSR, Kharkov. Inst. of Radio-Physics and Electronics.
A. I. Kalmykov, and V. V. Pustovoytenko.
Journal of Geophysical Research, Vol. 81, No. 12, p 1960-1964, April 20, 1976. 9 fig, 9 ref.

Descriptors: *Radio waves, *Radar, *Waves(Water), Model studies, Mathematical models, On-site investigations, Radiation, Measurement, Oceans, Oceanography, Electrical engineering
Identifiers: *Polarization, Scatttering, Backscatter, Sea surfaces, Radio signals, Cross polarization.

Measured results were presented of the amplitude and spectral characteristics of the envelopes of vertically and horizontally polarized and cross-polarized 3.2-cm radar backscatter signals from the surface of the sea at grazing angles less than 8 deg with fine range resolution. The features of scattering on vertical polarization were explained completely by the 'two-scale' model. For horizontal polarization, relatively stable backscatter signals, called 'bursts,' were observed in addition to the signals scattered by the capillary waves. The results were also used to explain features of the fading spectra of the signals for the different polarizations. (Sims-ISWS)
W77-01620

QUALITY OF GROUND WATER IN THE COASTAL AQUIFER NEAR VISAKHAPATNAM, INDIA,
Andhra Univ., Waltair (India). Dept. of Geophysics.
For primary bibliographic entry see Field 5B.
W77-01626

SEDIMENTARY MODEL FOR INTERTIDA MUDFLAT CHANNELS, WITH EXAMPLE FROM THE SOLWAY FIRTH, SCOTLAND,
Leeds Univ. (England). Dept. of Earth Science and Leeds Univ. (England). Div. of Geology.
P. H. Bridges, and M. R. Leeder
Sedimentology, Vol. 23, No. 4, p 533-552, Augu 1976. 18 fig, 2 tab, 23 ref.

Descriptors: *Europe, *Model studies, *Sedime transport, *Mud flats, Channels, Gully erosio Meanders, Erosion, Hydrology, Estuaries, Tide Tidal effects, Geomorphology, Chann morphology, Channel erosion.
Identifiers: *Point-bar, Cut-bank erosio Meander-bend tightness, Sedimentary model, Sc way Firth(Scotland).

Intertidal mudflat channels (gullies) in the Solw Firth, Scotland, possess width/depth ratios simil to meandering rivers. Most channels deeper tha m show cut-bank slides, but narrow, deep cha nels also have rotational slides on the point-b slopes. The channels display two types of poin bar. The first, associated with gently curved mea ders, is sigmoidal in profile. The second, a sociated with tight meander bends, possesses pronounced lower platform. The onset of flo separation in meander bends, a phenomen which enhances cut-bank erosion and point-b deposition, is a direct function of meander-ben tightness and Froude number. The effects of flo separation are greatest on tight meander bends times of high velocity during late spring ebb a also during rainfall run-off at low tide. The events appear to be responsible for the growth the point bar platforms. A model, predicting t type of point bar development to be expected different channel meanders, was used to reco struct the sedimentary history of active and fos point-bars. (Lee-ISWS)
W77-01629

GRAVITATIONAL CIRCULATION IN LON ISLAND SOUND,
State Univ. of New York at Stony Brook. Mari Sciences Research Center.
R. E. Wilson.
Estuarine and Coastal Marine Science, Vol. 4, N 4, p 443-453, July 1976. 7 fig, 16 ref.

Descriptors: *Estuaries, *Gravitational water, C culation, *New York, Estuarine environmen Tides, Tidal effects, Sea water, Freshwate Salinity, Density stratification, Waste dilutio *Water circulation.
Identifiers: *Gravitational circulation, *Lo Island Sound, Density gradients, Estuari characteristics, Tidal motions, Dynamic balanc Transport.

Long Island Sound has some important estuari characteristics including tidal motions transmitt from the sea and a dilution of seawater with fres water. Longitudinal salinity and associated densi gradients exist in the Sound throughout the ye and maintain non-tidal, two-layer gravitational c culation. The volume transport due to this circul tion was determined from simple dynamic comp tations based on a force balance between the ver cal gradient of the turbulent stress resulting fro tidal motions and the pressure gradient resulti from horizontal density variations. Data from fo hydrographic cruises conducted in the Sound b Marine Sciences Research Center were used evaluate the horizontal pressure gradient. T transport computations indicated that gravitatio circulation was well developed in the western a central Sound and was intense in the easte Sound. (Roberts-ISWS)
W77-01634

RESPONSE OF THE PATUXENT ESTUARY T A WINTER STORM,
Johns Hopkins Univ., Baltimore, Md. Chesapea Bay Inst.
A. J. Elliott.

Chesapeake Science, Vol. 17, No. 3, p 212-216, September 1976. 5 fig, 1 tab, 7 ref.

Descriptors: *Currents(Water), *Tides, *Chesapeake Bay, Current meters, Salinity, River flow, Water level fluctuations, Water levels, Storms, Winds, Estuaries, Mathematical studies, Maryland.
Identifiers: *Current records, *Tidal records, Patuxent Estuary(Md), River response, Surface slopes, Current meter moorings, Salinity sections, Tidal heights.

During March 17-18, 1973, 10-20 m/s winds blew steadily from the NW across the Chesapeake Bay area. These winds were part of a larger system of storms which affected the east coast. Current and tidal records from the Patuxent estuary were analyzed to investigate the response of the river to the storm. The Patuxent is a partially mixed, coastal plain estuary which is a tributary of the Chesapeake Bay. The storm depressed mean water levels throughout the Chesapeake area and the Patuxent required two days to recover to its former mean water level. Surface slopes provided evidence for the existence of a long period seiche, approximately 88 hours. In the Patuxent, mean levels dropped by about 50 cm. (Roberts-ISWS)
W77-01635

RESPONSES OF PHYTOPLANKTON TO RENEWED SOLAR RADIATION IN A STRATIFIED INLET,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 5C.
W77-01659

IMPACT OF WATER RESOURCE DEVELOPMENT ON COASTAL EROSION, BRAZOS RIVER, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
T. C. Mathewson, and L. L. Minter.
Texas Water Resources Institute, College Station, Completion Report TR-77, August, 1976. 85 p, 3 tab, 28 fig, 40 ref, 2 append. OWRT B-201-TEX(1). 14-34-0001-6123.

Descriptors: *Erosion rates, Hydrograph analysis, Texas, *Beach erosion, Deltas, Rivers, Reservoirs, *Sediment load, Dams, Water resources development, *Frequency curves, Regulation, Sediment transport, River basins.
Identifiers: *Coastal erosion, *Brazos River Delta(Tex).

Major dam and reservoir development within the Brazos River Basin is correlative with a significant decrease in the suspended sediment load of the river and with increased coastal erosion rates near the delta. A hydrologic analysis of the river discharge, by use of cumulative frequency curves, shows that discharge control by dam regulation has reduced the frequency of high discharges, thus smoothing out the river hydrograph and reducing the amount of sediment the river is able to carry and deliver to the coastal zone. In addition, the reservoirs are presently trapping about 76% of all sand produced within the basin. An analysis of bed load samples taken downstream of the dams indicated that the sand sizes necessary for beach nourishment are not being transported through the lower reaches of the river. The amount of sand denied access to the coastal zone through the loss of the river's transporting ability and reservoir entrapment has been determined, and is shown to be enough to account for the entire increase in the coastal erosion rates in the study area since at least 1937. Future sand losses brought about by the construction of new reservoirs downstream of those presently on the Brazos River, or one of its major tributaries, can be predicted by the decrease in the effective drainage basin area.
W77-01681

PROCEEDINGS OF THE NATIONAL WETLAND CLASSIFICATION AND INVENTORY WORKSHOP, 1975.
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
For primary bibliographic entry see Field 4A.
W77-01682

THE ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM. FIRST YEAR WORK PRODUCT: VOLUME I; THE LEGAL FRAMEWORK: LAKE MICHIGAN AND ITS SHORE,
For primary bibliographic entry see Field 6E.
W77-01689

THE POTENTIAL USE OF RESERVATIONS TO INTERNATIONAL AGREEMENTS PRODUCED BY THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA,
Louisiana State Univ. Law Center, Baton Rouge.
For primary bibliographic entry see Field 6E.
W77-01705

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: CARACAS,
Louisiana State Univ. Law Center, Baton Rouge.
For primary bibliographic entry see Field 6E.
W77-01706

USE OF OUTER BARS OF INLETS AS SOURCES OF BEACH NOURISHMENT MATERIAL,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
T. L. Walton, Jr., and R. G. Dean.
Shore and Beach, July 1976. 8 p, 4 fig, 1 tab, 11 ref.

Descriptors: *Barrier islands, *Shore protection, *Inlets(Waterways, Beaches, Sand bars).
Identifiers: *Beach nourishment, Outer bars, Beach fill.

Outer bars of inlets appear to contain large quantities of high quality material which can be used for beach nourishment purposes without significant adverse effects on adjacent beaches. Although the effective utilization of outer bar material will require innovative approaches to dredging technology, the split-hull work barge concept appears promising, particularly if a self-loaded capability can be added. The effect of removal of outer shoal material on adjacent beaches must be assessed for each individual situation and the relative merits of possible preferable material characteristics from these source areas weighed against increased pumping costs, etc. To properly assess the benefits to beach stability of different sized material from competing borrow areas, it will be necessary to evaluate existing methods of assessing compatibility of beach fill or develop improved procedures. (NOAA)
W77-01708

METHOD OF PROTECTING A PILE IMBEDDED IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD,
Union Oil Co. of California, Brea. (Assignee).
For primary bibliographic entry see Field 8D.
W77-01711

METHOD FOR MEASURING VELOCITY AND DIRECTION OF CURRENTS IN A BODY OF WATER,
Office of the Secretary (Navy), Washington, D. C. (Assignee).
For primary bibliographic entry see Field 7B.
W77-01713

SELF-REGULATING TIDE GATE,
Rockwell (W. S.) Co., Fairfield, Conn. (Assignee).
For primary bibliographic entry see Field 8C.
W77-01728

WATER GATE,
For primary bibliographic entry see Field 8C.
W77-01729

SUBTIDAL CONCRETE PILING FAUNA IN MONTEREY HARBOR, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5A.
W77-01783

EFFECTS OF SUSPENDED SOLIDS ON SELECTED ESTUARINE PLANKTON,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W77-01784

BENTHIC NUTRIENT REGENERATION AND ITS COUPLING TO PRIMARY PRODUCTIVITY IN COASTAL WATERS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W77-01789

A NOTE ON STANDING CROPS OF SPARTINA ALTERNIFLORA IN TEXAS AND FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-01792

SUSPENDED SEDIMENT DETERMINATION IN ESTUARINE WATERS FROM PHOTOMETER AND SECCHI DISC MEASUREMENTS,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 5A.
W77-01795

THE DEMONSTRATION AND STANDARDIZATION OF A METHOD FOR MONITORING THE ECOLOGICAL EFFECTS OF MARINE WASTE DISCHARGES.
Biome Co., Inc., Surfside, Calif.
For primary bibliographic entry see Field 5A.
W77-01806

ABUNDANCE AND SEASONAL DISTRIBUTION OF MARINE MAMMALS IN THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01827

BIOLOGY OF THE HARBOR SEAL, PHOCA VITULINA RICHARDI, IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 6G.
W77-01831

DISTRIBUTION AND ABUNDANCE OF SEA OTTERS IN SOUTHWESTERN BRISTOL BAY,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01836

POPULATION ASSESSMENT, ECOLOGY AND TROPHIC RELATIONSHIPS OF STELLER SEA LIONS IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 6G.
W77-01837

OUTER CONTINENTAL SHELF ASSESSMENT PROJECT. RAZOR CLAM HABITAT SURVEY - GULF OF ALASKA,
Alaska Dept. of Fish and Game, Kodiak.
For primary bibliographic entry see Field 6G.
W77-01843

A DESCRIPTION AND NUMERICAL ANALYSIS OF THE FACTORS AFFECTING THE PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6G.
W77-01844

REVIEW OF LITERATURE AND HISTORICAL DATA ON NON-SALMONID PELAGIC FISHERIES RESOURCES OF THE EASTERN BERING SEA AND GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01845

BASELINE CHARACTERIZATION, LITTORAL BIOTA, GULF OF ALASKA AND BERING SEA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.
For primary bibliographic entry see Field 6G.
W77-01846

PLANKTON OF THE GULF OF ALASKA - ICHTHYOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01847

INITIAL ZOOPLANKTON INVESTIGATIONS,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-01848

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY IN THE NORTHEAST GULF OF ALASKA,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-01849

BASELINE STUDIES OF DEMERSAL RESOURCES OF THE NORTHERN GULF OF ALASKA SHELF AND SLOPE: AN HISTORICAL PREVIEW,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01852

BEAUFORT SEA ESTUARINE FISHERY STUDY,
Alaska Dept. of Fish and Game, Fairbanks. Sport Fish Div.
For primary bibliographic entry see Field 6G.
W77-01854

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01855

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE AND PRODUCTIVITY OF BENTHIC ORGANISMS OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01856

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01857

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BERING SEA AND GULF OF ALASKA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01858

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BEAUFORT SEA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01859

THE PHYSIOLOGICAL EFFECT OF ACUTE AND CHRONIC EXPOSURE TO HYDROCARBONS OF PETROLEUM ON THE NEAR-SHORE FISHES OF THE BERING SEA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5C.
W77-01864

RESPONSE OF THE CLAM, MACOMA BALTHICA (LINNAEUS), ESPOSED TO PRUDHOE BAY CRUDE OIL AS UNMIXED OIL, WATER-SOLUBLE FRACTION, AND SEDIMENT-ADSORBED FRACTION IN THE LABORATORY,
National Marine Fisheries Services, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Services, Seattle, Washington. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01867

EFFECT OF PETROLEUM HYDROCARBONS ON BREATHING AND COUGHING RATES, AND HYDROCARBON UPTAKE-DEPURATION IN PINK SALMON FRY,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01868

ACUTE EFFECTS - PACIFIC HERRING ROE IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-01872

EVALUATION STRATEGIES OF METAL POLLUTION IN OCEANS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W77-01875

ANNUAL OPERATION OF A COASTAL GROUNDWATER BASIN AT A PRESCRIBED RELIABILITY LEVEL,
Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.
For primary bibliographic entry see Field 4B.
W77-01882

POLLUTION OF THE RIVER TYNE ESTUARY--THE USE OF MATHEMATICAL MODELS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-01889

THE EFFECT OF THE NON-IDEAL COMPOSITION OF SEA WATER ON SALINITY AND DENSITY,
Woods Hole Oceanographic Institution, Mass.
P. G. Brewer, and A. Bradshaw.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 411. Price codes: A02 in paper copy, A01 in microfiche. Technical Report WHOI-76-16. March 1976. Reprinted from Journal of Marine Research, Vol. 33, No. 2, p 157-175, 1975. 3 fig, 4 tab, 26 ref. ONR N00014-74-C-0262, NSF GX-33295.

Descriptors: *Model studies, *Sea water, *Salinity, *Density, Mathematical models, Water chemistry, Saline water, Oceans, Chemicals, Chemical properties, Conductivity, Oceanography, *Carbon dioxide, *Silica, Pacific Ocean.

The effect of the increased alkalinity, total carbon dioxide, and silica content of deep ocean water on the conductance-salinity-density relationship was calculated. The results led to the postulation that a density correction term can be derived represented by Delta sigma theta = 0.0537 Delta TA -0.0096 Delta Sigma C02 + 0.042 Delta Si where Delta TA, Delta Sigma C02 and Delta Si are the alkalinity, total carbon dioxide, and silica concentration differences, in m. equiv./kg, m. moles/kg and m. moles/kg respectively, between the sample in question and an 'ideal' North Atlantic surface sea water. This correction term reaches values of up to + 0.012 sigma theta in the North Pacific, equivalent to that caused by an error of 0.1 C, or 0.015 parts per thousand salinity. These corrections are not insignificant in terms of the precision of modern hydrographic data. The effect of these corrections leads to an adjustment of up to 500 m in the depth of an isopycnal surface. The accuracy of the correction term is less certain at high pressures, and we have no information on the effect of compositional changes of this kind on compressibility. The definition of salinity is not an issue here; however, in the abyssal Pacific Ocean salinity as used to calculate density is in error by 0.012 parts per thousand and as a truly conservative tracer by +0.008 parts per thousand. (Sims-ISWS)
W77-01911

A PRELIMINARY TIDAL EXCHANGE EXPERIMENT IN MASSET INLET,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
F. G. Barber, T. S. Murty, and J. Taylor.
Manuscript Report Series No. 39, 1975. 41 p, 9 fig, 32 ref.

Descriptors: *Inlets(Waterways), *Arctic, *Model studies, *Mathematical models, Tidal streams, Tidal waters, Flow, Hydraulics, Circulation, Water circulation, Tides, Hydrodynamics, Hydrography, Precipitation(Atmospheric), Runoff, On-site data collections, Computer models, Estuaries.
Identifiers: *Tidal exchange.

Concepts of exchange processes were reviewed briefly, including a tidal exchange process believed to have been observed in a small tidal inl

n the Arctic. The results of a numerical experiment with the latter process in a configuration similar to Masset Inlet were presented, and a proposal concerning a field experiment was developed. (Sims-ISWS)
W77-01916

VARIATIONS IN COASTAL TEMPERATURES ON THE SOUTHERN AND CENTRAL CALIFORNIA COAST,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
E. J. List, and R. C. Y. Koh.
Journal of Geophysical Research, Vol. 81, No. 12, p 1971-1979, April 20, 1976. 11 fig, 24 ref. NSF ENG75-02985.

Descriptors: *Water temperature, *Coasts, California, *Pacific Ocean, Measurement, Time series analysis, Data processing, Analytical techniques, Fluctuations, Analysis, Correlation analysis, Oceanography.
Identifiers: *Temperature variations, Coastal temperatures.

The results of a time series analysis of several years of coastal ocean temperature records were presented for discussion. The records were analyzed by using digital filtering, covariance, and spectral analysis. The following conditions were found to exist: The low-frequency component of the temperature signal shows a strong seasonal component in southern California There is little seasonal fluctuation between Point Conception and Pacific Grove. A period of midwinter warming is apparent in southern California. Intermediate frequency components show strong correlations in southern California with the presence of distinct and substantial temperature events occurring almost simultaneously over distances of the order of 100 km. High-frequency components have a large standard deviation in summer (0.8C) and a low standard deviation in winter (0.4C); these components are uncorrelated at stations even a few miles apart. Some coastal stations show a strong possible diurnal component; others, including the stations on offshore islands, show no such components. Morro Bay appears to have an extraordinarily large diurnal component of temperature fluctuation. No attempt was made to relate these phenomena to other oceanographic or meteorological variables. (Sims-ISWS)
W77-01917

ON THE POSSIBLE DETECTION OF TSUNAMIS BY A MONITORING OF THE IONOSPHERE,
Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
V. R. Peltier, and C. O. Hines.
Journal of Geophysical Research, Vol. 81, No. 12, p 1995-2000, April 20, 1976. 3 fig, 22 ref.

Descriptors: *Tsunamis, *Monitoring, *Ocean waves, Waves(Water), Earthquakes, Warning systems, *Atmosphere, Oceans, Equations, Hazards, Oceanography.
Identifiers: *Ionosphere, Tsunami detection.

It has been suggested that the atmospheric gravity waves that are generated by a tsunami may produce an identifiable ionospheric signature that could be employed for purposes of tsunami warnings. The intrinsic difficulties to be faced by this suggestion derive from the geometrical spreading of the tsunami signature, from the possible occurrence of heights of null response, from the reflection and absorption of wave energy in the regions between the ocean surface and the ionospheric height of observation, from the time delay experienced by the tsunami signature in reaching that height, from a degradation of amplitude when the signature is detected via its effect on isopleths of electron concentration, and from the competition of 'noise' that would obscure the signature. These difficulties were assessed in this paper and were found to be of only marginal consequence to the original suggestion, which is reinforced, therefore, as a proposal for an operational system. (Sims-ISWS)
W77-01918

CALCIUM CARBONATE DISTRIBUTION IN THE SURFACE SEDIMENTS OF THE INDIAN OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
V. Kolla, A. W. H. Be, and P. E. Biscayne.
Journal of Geophysical Research, Vol. 81, No. 15, p 2605-2616, May 20, 1976. 5 fig, 2 tab, 66 ref. ONR N00014-75-04204-A04, NSF DES-75-01568-A03.

Descriptors: *Sediments, *Calcium carbonate, *Indian Ocean, Surveys, Measurement, Mapping, *Distribution patterns, *Sediment distribution, Spatial distribution, Bathymetry, Depth, Oceans, Chemicals, Carbonates, Calcium compounds, Detritus, Recent epoch, Sedimentology, Oceanography.
Identifiers: Calcium carbonate distribution, Surface sediments.

A comprehensive calcium carbonate map for the Indian Ocean surface sediments was prepared from the analysis of about 1200 samples. The results of the analysis showed: The percent carbonate distribution shows the well-known, first-order correlation with depth, and hence, reflects the physiographic peculiarities of the Indian Ocean. Thus, on topographic highs such as most of the mid-Indian ridge, Ninety East ridge, etc., the carbonate is high (greater than 75%), whereas in deep areas such as the Wharton, Central Indian, Madagascar, and Somali basins the carbonae is low (less than 10%). Dilutions by terrigenous debris are marked in the Bay of Bengal and Arabian Sea adjacent to the Indian subcontinent and in the Mozambique Basin off southeast Africa. When the regions with significant terrigenous dilutions are excluded, certain systematic latitudinal variations in the carbonate carbonate critical depth (CCrD, depth below which less than 10% $CaCO_3$ is present) and carbonate lysocline (depth at which a significant decrease in carbonate percent occurs) superimposed on the general first-order depth changes are evident. The CCrD is deepest in the equatorial region (10 deg N-10 deg S). Southward it gradually becomes shallow and reaches 4800-4600 m in the 20 deg S-30 deg S region and 4800 m in the 30 deg S-40 deg S region. It tends to deepen (approximately 4900 m) slightly in the 40 deg S-50 deg S region. The CCrD attains the shallowest level (3900 m) in the southernmost region (50 deg S-60 deg S) studied. The carbonate lysoclinal variation is in general opposite to that of the critical depths in the ocean north of 50 deg S and is the same as the critical depth in the 50 deg S-60 deg S region. These differences reflect the patterns of oceanic productivity and the dissolution effects of Antarctic Bottom Water. Low carbonate contents along with the presence of Antarctic diatoms and siliceous clay reported at 26 deg S-29 deg S and 60 deg E-64 deg E suggest a passage in the mid-Indian ridge in that area for the Antarctic Bottom Water flowing from the Crozet Basin to the Madagascar Basin. (Sims-ISWS)
W77-01919

EDDY ENERGY IN THE OCEANS,
Hawaii Univ., Honolulu. Dept. of Oceanography.
K. Wyrtki, L. Magaard, and J. Hager.
Journal of Geophysical Research, Vol. 81, No. 15, p 2641-2640, May 20, 1976. 5 fig, 16 ref.

Descriptors: *Eddies, *Energy, *Oceans, *Atlantic Ocean, Distribution patterns, Circulation, Ocean circulation, Data processing, Velocity, Currents(Water), Water circulation, Energy transfer, Oceanography.
Identifiers: *Eddy energy.

Observations of surface drift currents made by merchant ships were used to calculate the kinetic energy of the mean flow as well as the kinetic energy of the fluctuations, which is interpreted as eddy kinetic energy. The distribution of these properties was charted for the North Atlantic Ocean based on 1 deg squares and for the world oceans based on 5 deg squares. Both distributions showed essentially the same features; namely, high values in the western boundary currents and in the equatorial current system, and low values in the subtropical gyres. The ratio between mean energy and eddy energy was high (about 1 to 2) in the strong currents and low (about 1/20 to 1/40) in the central and eastern portions of the gyres. Comparing mean and eddy energies in ocean and atmosphere, it became apparent that edddy energies in the two systems are uncorrelated. The results were consistent with the idea that eddy motion in the ocean is generated in areas of strong mean shear flow and is subsequently distributed over the whole ocean. (Sims-ISWS)
W77-01920

WAVE PATTERNS ACROSS THE NORTH ATLANTIC ON SEPTEMBER 28, 1974, FROM AIRBORNE RADAR IMAGERY,
Jet Propulsion Lab., Pasadena, Calif.
C. Elachi.
Journal of Geophysical Research, Vol. 81, No. 15, p 2655-2656, May 20, 1976. 2 fig, 1 ref. NASA NAS7-100.

Descriptors: *Remote sensing, *Ocean waves, *Aircraft, *Atlantic Ocean, Radar, Waves(Water), Aerial photography, Weather, Storms, Wavelengths, Oceans, Oceanography.

Airborne coherent radar imagery taken during a cross-Atlantic flight was used to determine the two-dimensional wave pattern of waves on a path across the North Atlantic on September 28, 1974. The radar imagery was compared to ship reports and to photographs taken during the part of the flight when no clouds were present. The wave images were related to the presence of two major storm areas in the North Atlantic just before flight time. (Sims-ISWS)
W77-01921

EVIDENCE OF SALT-WATER INTRUSION IN SOUTHEASTERN LONG ISLAND,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-01924

ON THE DEVELOPMENT OF A SEASONAL CHANGE SEA-ICE MODEL,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2C.
W77-01925

THE NONTIDAL FLOW IN THE PROVIDENCE RIVER OF NARRAGANSETT BAY: A STOCHASTIC APPROACH TO ESTUARINE CIRCULATION,
Rhode Island Univ., Kingston, Graduate School of Oceanography.
R. H. Weisberg.
Journal of Physical Oceanography, Vol. 6, No. 5, p 721-734, September 1976. 16 fig, 4 tab, 24 ref.

Descriptors: *Currents(Water), *Winds, *Estuaries, *Rivers, *Rhode Island, Current meters, Measurement, On-site investigations, Circulation, Water circulation, Stochastic processes, Velocity, Fluctuations, Atmosphere, Salinity, Density, Water temperature, Model studies, Mathematical models, Oceanography.
Identifiers: *Narragansett Bay(RI), *Providence River(RI).

Atmospherically driven flow in the Providence River (a partially mixed estuary) was examined using a 51-day velocity record measured 2 m from the bottom. Velocity fluctuations at time scales between the steady-state gravitational convection and the tidal oscillations were large and almost exclusively wind induced. The mean and variance of the velocity component lying along the channel axis were 11.7 cm/s (landward) and 166.9 sq cm/sec squared. Of this axial current variance, 48% resided at subtidal frequencies as compared with 45% associated with semidiurnal tides (the remaining 7% was mostly due to higher tidal harmonics). Over the most energetic portion of the axial current spectrum (periodicities of 4-5 days), 97% of the variance was coherent with the wind velocity component lying along the direction of maximum fetch, with the current lagging the wind by about 4 h. Owing to this extremely high coherence, a linear time-invariant stochastic model reproduced the axial current from the two orthogonal wind velocity components to within an rms error of 2.3 cm/s. The wind also had a marked effect upon the density field. It was concluded that the effects of wind can permeate the entire water column of a partially mixed estuary and can be of equal (or greater) importance to the circulation as the tides or gravitational convection. (Sims-ISWS)
W77-01926

PROBABILITY DISTRIBUTION OF CONCENTRATIONS MEASURED IN THE WAKE OF A CONTINUOUS POINT SOURCE IN COASTAL CURRENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W77-01927

DISPERSION OF POLLUTANTS IN THE STRAIT OF CANSO,
Nova Scotia Technical Coll., Halifax. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W77-01928

AN ANALYSIS OF INSTABILITIES CAUSED BY SALINITY GRADIENTS IN GROUNDWATER,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-01931

RADAR IMAGING OF OCEAN SURFACE PATTERNS,
Jet Propulsion Lab., Pasadena, Calif.
W. E. Brown, Jr., C. Elachi, and T. W. Thompson.
Journal of Geophysical Research, Vol. 81, No. 15, p 2657-2667, May 20, 1976. 15 fig, 23 ref. NASA NAS7-100.

Descriptors: *Remote sensing, *Ocean waves, *Radar, *Aircraft, Oceans, Waves(Water), Equations, Data processing, Currents(Water), Internal waves, Coasts, Model studies, Investigations, Equipment, Oceanography, Electrical engineering.
Identifiers: *Radar imagery, Backscatter, Surface patterns, Surface slicks, Coastal waves.

Radar imagery of ocean surface patterns was presented and discussed. The imaging radar detected changes in ocean surface backscatter and yielded imagery of deepwater gravity waves, oil slicks, island shadows, internal waves, coastal waves, and other features. The results of several observations suggested that the surface irregularities behave as isotropic scatterers for a radar wavelength of 25 cm. The popular scattering models were considered in relation to this behavior. The variable incident angle and high resolution of the imaging radar allowed the study of the scattering properties of particular surface phenomena. (Sims-ISWS)
W77-01932

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ESCAMBIA RIVER AND BAY,
Atlantis Scientific, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W77-01961

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GULF OF ALASKA.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01966

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, S. CALIFORNIA BIGHT.
Tetra Tech, Inc., Pasadena, California.
For primary bibliographic entry see Field 5G.
W77-01969

DIRECTORY TO U.S. GEOLOGICAL SURVEY PROGRAM ACTIVITIES IN COASTAL AREAS, 1974-76,
Geological Survey, Reston, Va
Available from Supt. of Documents, GPO, Wash., D.C. 20402 Price $1.75. Resources and Land Investigations Program, Bulletin 1428, 1976. 154 p, 14 fig, 2 tab, 4 ref. Marcus, P. A., Editor.

Descriptors: *Coasts, *Programs, *United States, *Federal government, *Projects, Indexing, Surface waters, Groundwater, Water quality, Topographic mapping, Energy budget, Earthquake engineering, Volcanoes, Geochemistry, Mineralogy, Oceanography, Estuarine environment, Streamflow, Water analysis, Ecology, Land use, Regulation.
Identifiers: *U.S. Geological Survey coastal programs, Directory.

This report describes 16 U.S. Geological Survey program activities in coastal areas of the United States and its territories during 1974-76 and lists the products of each project in the programs. It provides access to the Earth-science and other natural-science investigations in which the Geological Survey is currently engaged and which are capable of supporting coastal zone planning activities. Responsible individuals who can provide further assistance concerning project activities are listed. The text is organized by subject, and an index is provided for direct reference of projects on a State or territorial basis. (Woodard-USGS)
W77-02011

PICHIA SPARTINAE, A DOMINANT YEAST OF THE SPARTINA SALT MARSH,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 5C.
W77-02039

OPTIMIZING SELECTION OF MARINE RETAINING WALLS,
Mueser, Rutledge, Wentwork and Johnston, New York.
For primary bibliographic entry see Field 8F.
W77-02072

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

FINAL REPORT, MSF MODULE STUDIES, OSW SAN DIEGO TEST FACILITY.
Burns and Roe Construction Corp., Paramus, N. J.
OWRT/S--76/48, May 1973. 152 p, 17 fig, 2 tab, 4 append. DOI 14-30-3014.

Descriptors: *Desalination plants, *Flash distillation, Treatment facilities, Desalination apparatus, *Performance, *Testing, *Measurement, Baseline data collections.
Identifiers: *Multi-stage flash distillation modules, *Delta prime measurement.

This topical report covers development test programs conducted between August, 1972 and January 5th, 1973. The emphasis during this six month run was on delta prime measurement and flash enhancer testing. Baseline data were collected over a range of stage operating condition during trend series. Similar evaluations of delta prime were then made with a Desalting Systems and Services' enhancer, the Aqua-Chem dragon's teeth enhancer, a simple plow enhancer and with a flat-bottomed stage. These tests are discussed in detail.
W77-01551

HYGIENIC ASSESSMENT OF MEMBRANE METHODS OF WATER DESALINIZATION, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W77-01554

METHOD FOR PRODUCING MECHANICAL ENERGY FROM GEOTHERMAL BRINE.
Union Oil Co. of California, Brea. (Assignee)
For primary bibliographic entry see Field 3C.
W77-01710

LIQUID TREATING SYSTEM,
For primary bibliographic entry see Field 5F.
W77-01739

OSMOSIS PROCESS FOR PRODUCING ENERGY,
H. H. G. Jellinek.
U.S. Patent No. 3,978,344, 7 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 949, no 5, p 2134-2135, August 31, 1976.

Descriptors: *Patents, *Energy, *Sea water, *Freshwater, *Saline water-freshwater interface, *Boundary processes, Membranes, Semipermeable membranes, Membrane processes, *Osmosis, *Osmotic pressure, *Desalination processes.
Identifiers: Energy production.

A process for generating energy utilizes the osmotic pressure resulting when two liquids having different chemical potentials are each placed in contact with opposite sides of the same semipermeable membrane. The process is particularly applicable to the production of energy from the system sea water/fresh water. Fresh water will pass through the semipermeable membrane into the salt water resulting in a build-up of osmotic pressure which causes salt water to be ejected through the outlet orifice. The energy can be obtained in the neighborhood of locations where fresh water (rivers) flows into the sea. The fresh water is brought into contact via the semipermeable membrane with sea water. The pressure generated by the flow of fresh water into the sea water is represented by the height of solution which has risen in a pipe installed at the top of the osmotic pressure generator. The pipe can be cut at the point where it is joined to the osmotic pressure vessel allowing the saline solution to flow out of the hole. A turbine can be rotated by the ejected liquid and electrical or mechanical energy obtained. (Sinha-OEIS)
W77-01751

ELECTROCHEMISTRY,
Southampton Univ. (England). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 5D.
W77-01999

3B. Water Yield Improvement

VATER YIELDS RESULTING FROM TREAT-IENTS ON THE WORKMAN CREEK EXPERI-IENTAL WATERSHEDS IN CENTRAL ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Temple, Ariz.
For primary bibliographic entry see Field 4C.
W77-01660

INAL REPORT, HIGH PLAINS COOPERA-IVE PROGRAM CLOUD SURVEY AND SEED-NG RESEARCH AIRCRAFT AND AS-OCIATED DATA PROCESSING,
Colorado International Corp., Boulder.
L. T. Beaumont.
Report to Bureau of Reclamation, Denver, Colorado, Division Atmospheric Water Resources Management, September 1976, 22 p. 6-07-DR-0100.

Descriptors: *Weather modification, *Cloud seeding, *Silver iodide, Measurement, Montana, Artificial precipitation, Instrumentation, Atmosphere.
Identifiers: *Cloud measurements, Cloud modifications, Dry ice, Airborne equipment.

An instrumented aircraft capable of seeding clouds with silver iodide and dry ice was operated as part of the Hiplex Program at Miles City, Montana during June and July, 1976. Seeding systems included AgI-NH4I acetone generators, wing and fuselage mounted racks for ejectable and burn-in-place AgI pyrotechnic flares. Dry ice (CO2) in the form of small pellets was also released from the aircraft. Variable concentration and delivery methods were used to evaluate seeding materials and dispersion techniques. An on-board data system recorded cloud parameters during survey and seeding experiments. All flight observations of atmospheric data i.e. air temperature, dew point, pressure, indicated air speed, liquid water content, rate of climb were observed every 8.5 sec and recorded on computer compatible magnetic tape. Seeding locations and pertinent data concerning seeding are given. (Bureau of Reclamation)
W77-01687

STRATEGIES TO IMPROVE WATER MANAGEMENT IN MEXICAN IRRIGATION DISTRICTS: A CASE STUDY IN SONORA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3F.
W77-01894

PROVIDING FOR PROVIDENT DOGONS,
A. Guggenheim.
The Geographical Magazine, Vol. 48, No. 2 p. 664-669, August, 1976. 1 fig.

Descriptors: *Water storage, *Social aspects, Arid lands, *Droughts, *Africa, Storage, Adaptation, Technology, Water loss, Dependable supply, Rainfall, *Africa.
Identifiers: *Sahel, Dogon, Mali.

The Dogon tribesmen of Mali who farm the arid lands of the Sahel have evolved a complex religion and philosophy based on seasons of drought and rain. An attempt to bring technology of water storage to the Dogon and to graft it onto their culture while protecting their ancient traditions is discussed. Water storage is difficult because of porous sandstone formations. Annual rainfall varies from 300 mm. to 600 mm. and the main grain crop, millet, suffers because it depends upon regularized rainfall. Thus, water storage is important. Dogon philosophy contains a never ending struggle between the god of water and god of drought. The author discusses construction of water storage facilities for consumption and irrigation within the context of this philosophy. (Jamail-Arizona)
W77-01896

RAINFALL INTERCEPTION BY COOL-DESERT SHRUBS,
Utah State Univ., Logan. Dept. of Range Science.
N. E. West, and G. F. Gifford.
Journal of Range Management, Vol. 29, No. 2, p 171-172, March, 1976. 7 ref.

Descriptors: *Impact(Rainfall), *Rainfall-runoff relationships, *Vegetation effects, *Desert plants, *Interception, Precipitation(Atmospheric), Rain, Rainfall, Sagebrush, Shrubs, Soil surfaces, Stemflow, Canopy, Cycling nutrients, Arid lands.

Interception patterns of big sagebrush and shadscale were measured under two simulated rainfall intensities during three different seasons for improved understanding of this phenomena in hydrologic and mineral nutrient cycling processes. Plants were collected and subjected to simulated rainfall. All plants were cut off at their stem bases, placed in a holding device on a direct reading balance, and weight gains under simulated rainfall recorded at the end of 30, 60, 120, 300, 600, at 900-second intervals, and the data subjected to analysis of variance. Mean rainfall interception rate of individual plants of both species was 0.15 centimeters when averaged over all sampling dates and rainfall intensities. On the average about 4 percent of the total annual rainfall (not snowfall) would be intercepted by these plant communities. The results will be utilized in modelling of water and mineral nutrient cycles in these ecosystems. (Jamail-Arizona)
W77-01900

3C. Use Of Water Of Impaired Quality

ACTIVITY OF NITRATE REDUCTASE IN THE ABOVEGROUND PART OF CORN UNDER CONDITIONS OF SALINIZATION OF THE MEDIUM, (IN RUSSIAN),
B. A. Alina, and L. K. Klyshev.
Izv Akad Nauk Kaz Ssr Ser Biol 13(4), p 28-31, 1975.

Descriptors: *Nitrates, *Corn(Field), Nutrients, Salinity, *Salt tolerance, Sodium chloride, Sodium sulfate, Leaves.
Identifiers: *Nitrate reductase activity(Corn).

The nitrate reductase activity of 10-15 day-old corn sprouts (leaves and stem) grown in a water culture on a nutrient medium containing various N sources (NaNO3, NH4NO3, ammonium sulfate) were investigated. NaCl and Na2SO4 were added in isoosmotic concentrations. The nitrate reductase activity of corn sprouts depended on the age of the plants and N source used. NaCl and Na2SO4 in isoosmotic concentrations caused activation of nitrate reductase in the aboveground part of corn.
W77-01599

IRRIGATION OF CORN WITH EFFLUENTS FROM FERMENTATION AND YEAST-PRODUCING PLANTS (OROSHENIE KUKURUZY STOCHNYMI VODAMI GIDROLIZNO-DROZHZHEVOGO PROIZVODSTVA),
For primary bibliographic entry see Field 5D.
W77-01645

THE INFLUENCE OF TRICKLE IRRIGATION ON THE QUALITY OF IRRIGATION RETURN FLOW,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 5G.
W77-01680

METHOD FOR PRODUCING MECHANICAL ENERGY FROM GEOTHERMAL BRINE,
Union Oil Co. of California, Brea. (Assignee).
T. K. Sherwood.
U.S. Patent No. 3,972,193, 10 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, no 1, p 52, August 3, 1976.

Descriptors: *Patents, *Geothermal studies, *Thermal properties, *Temperature, Heat flow, Flash distillation, Heat exchangers, Heat transfer.

This invention comprises the steps of producing hot geothermal brine from subterranean geothermal reservoir; passing the brine successively through a series of separate flash stages, each successive stage being maintained at a lower pressure less than the vapor pressure of the brine entering that stage so that the brine is partially flashed to vapor in each stage; countercurrently flowing a working fluid successively through the series of flash stages in indirect heat exchange with the vapor produced in each flash stage so that the vapor condenses in each flash stage and the working fluid is progressively heated as it passes through the series of flash stages; and, then, utilizing the heated working fluid in a heat engine for the production of mechanical energy. The advantages are that the hot geothermal brine does not directly contact a heat exchange surface and the hot vapors are not fed to the heat engine. The working fluid can be heated to a temperature near the temperature of the geothermal brine by the use of incremental pressure reductions in each successive flash stage. (Sinha-OEIS)
W77-01710

SHALLOW GROUND-WATER SALINIZATION IN DRYLAND FARM AREAS OF MONTANA,
Montana Univ., Missoula. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-01822

AGRICULTURAL WATER POLLUTION: SOME PROBLEMS ASSOCIATED WITH ITS CONTROL,
Kansas Univ., Lawrence. Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-01898

ABSCISIC ACID LEVEL IN TOMATO LEAVES AFTER A LONG PERIOD OF WILTING,
Aarhus Univ., (Denmark). Inst. of Plant Physiology.
For primary bibliographic entry see Field 2I.
W77-01906

EVALUATION OF AGRICULTURAL ADJUSTMENT TO IRRIGATION WATER SALINITY: A CASE STUDY FOR PINAL COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. A. Boster.
Ph.D. Dissertation, 1976. 180 p, 8 fig, 27 tab, 50 ref. OWRT A-048-ARIZ (3).

Descriptors: *Irrigation water, *Salinity, *Water costs, *Irrigation effects, *Water management(Applied), *Water quality, Irrigation effects, *Arizona, Irrigation, Crop production, Available water, Irrigation districts, Mathematical models, Irrigation efficiency, Salts, Irrigated land, Water sources.
Identifiers: *Central Arizona project.

The Central Arizona Project will make Colorado River water available for use in Pinal County, Arizona. The imported water will contain dissolved salts which will decrease irrigated crop yield. The optimal imported water-local water mix is determined in order to evaluate the economic adjustments of Pinal County farmers to the new water source. Mathematical programming models

of representative irrigated farms in Pinal County project adjustments implied under several assumptions as to the availability, cost and salinity of irrigated water from various sources. Results indicate that: (1) Indian farmers will receive most of the economic benefits of the project; (2) groundwater conservation will be minimal unless farmers are forced to purchase large quantities of the imported water; (3) imported water will not affect cotton acreage but will significantly increase the acreage of small grains and alfalfa; (4) salinity increase will not cause large decreases in farmer's incomes; and (5) increased income to non-Indian farmers from provision of Central Arizona Project water at the currently proposed price will not be sufficient to pay the additional fixed costs for distribution systems. (Jamail-Arizona)
W77-01909

RESPONSE OF COTTON TO NITROGEN AND WATER IN A TROPICAL ENVIRONMENT. III. FIBRE QUALITY,
Commonwealth Scientific and Industrial Research Organization, Kununurra (Australia). Div. of Land Research.
For primary bibliographic entry see Field 3F.
W77-01910

ARKANSAS RIVER WATER QUALITY RELATED TO THE IRRIGATION POTENTIAL OF ASSOCIATED SOILS,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-02065

3D. Conservation In Domestic and Municipal Use

CHARACTERIZATION OF URBAN RUNOFF - NEW JERSEY,
Rutgers - The State Univ., New Brunswick N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W77-01945

SOME CONSEQUENCES OF AREA WIDE RUNOFF CONTROL STRATEGIES IN URBAN WATERSHEDS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-01947

WATER POLLUTION CONTROL LAW OF 1972, REGIONAL IMPACTS, KANAWHA RIVER.
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-01975

3E. Conservation In Industry

HYGIENIC EVALUATION OF THE STATE OF PROTECTION OF A WATER BODY FROM POLLUTION IN THE REGION OF AN INDUSTRIAL COMPLEX, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W77-01555

HYGIENIC CHARACTERISTICS OF WASTEWATER TREATMENT PROCESSES OF FLAX-PROCESSING PLANTS, (IN RUSSIAN),
For primary bibliographic entry see Field 5D.
W77-01556

THE WASTE TREATMENT FACILITY OF MONADNOCK PAPER MILLS, INC.
For primary bibliographic entry see Field 5D.
W77-01641

INTRODUCTION OF A NEW EFFLUENT PURIFICATION SYSTEM (VNEDRENIE NOVOI SKHEMY OCHISTKI STOKOV),
Penzenskaya Bumazhnaya Fabrika 'Mayak Revolutsii' (USSR).
For primary bibliographic entry see Field 5D.
W77-01644

MODERN METHODS OF PURIFYING PULP AND PAPER MILL EFFLUENTS (SOVREMENNYE METODY OCHISTKI STOCHNYKH VOD PREDPRIATII TSELLYULOZNO-BUMAZHNOI PROMYSHLENNOSTI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR); and Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidroliznoi Promyshlennosti, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W77-01657

WATER IN GENERAL AND ITS INDUSTRIAL USE IN PARTICULAR (ALLGEMEINES UEBER DAS WASSER UND BESONDERES UEBER SEINEN INDUSTRIELLEN GEBRAUCH),
W. Brecht.
Zellstoff und Papier, Vol. 25, No. 8, p 240-246, August, 1976. 4 fig, 26 ref, 3 tab.

Descriptors: *Water supply, *Water demand, *Industrial water, Hydrologic cycle, United States, Africa, Water purification, Waste water treatment, Pulp and paper industry, Water reuse, Water conservation.
Identifiers: USSR, Closed systems.

The available water of the world is estimated, and its cycle in nature is discussed. In connection with supply and demand, some large projects planned in America, the Soviet Union, and Africa are pointed out. The industrial use of water usually requires preliminary purification as well as effluent purification. Means for reducing the requirements of fresh water for pulp and paper mills are discussed, especially closed systems for water circulation. (Ward-IPC)
W77-01661

BLEACH MODIFICATIONS TO REDUCE POLLUTANTS,
Weyerhaeuser Co., Everett, Wash.
For primary bibliographic entry see Field 5D.
W77-01663

USE OF CHLORINE DIOXIDE-ALKALI FOR HIGH-YIELD PULPING,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5D.
W77-01664

AN OVERVIEW OF NEW PULP BLEACHING DEVELOPMENTS,
Hooker Chemicals and Plastics Corp., Niagara Falls, N. Y.
For primary bibliographic entry see Field 5D.
W77-01665

DISPOSAL OF FLEXO INK WASHUP WASTE WATER,
For primary bibliographic entry see Field 5D.
W77-01670

WHITEWATER SYSTEM CLOSURE IN NSSC CORRUGATING MEDIUM MANFACTURE,
Green Bay Packaging Inc., Wis.
For primary bibliographic entry see Field 5D.
W77-01673

AN INVESTIGATION OF THE SEPARABILITY AND REUSE POTENTIAL OF THE ASH COMPONENT OF HIGH-ASH CONTENT PAPER MILL SLUDGES,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W77-01679

MAGNETIZATION OF IRON CHROMIUM SYSTEM,
Ford Motor Co., Dearborn, Mich. (Assignee).
For primary bibliographic entry see Field 5D.
W77-01709

TREATMENT OF CONDENSATES,
Societe d'Assistance Technique pour Porduits Nestle S.A., Lausanne (Switzerland). (Assignee).
For primary bibliographic entry see Field 5D.
W77-01716

REMOVAL OF CHROMIUM, CHROMATE, MOLYBDATE AND ZINC,
Chemical Separations Corp., Oak Ridge, Tenn. (Assignee)
For primary bibliographic entry see Field 5G.
W77-01717

FILTER, ESPECIALLY FOR BACK WATER,
Myrens Verksted A/S, Oslo (Norway). (Assignee).
For primary bibliographic entry see Field 5D.
W77-01720

WATER RECYCLE TREATMENT SYSTEM FOR USE IN METAL PROCESSING,
Data General Corp., Southboro, Mass. (Assignee).
For primary bibliographic entry see Field 5D.
W77-01724

APPARATUS FOR REMOVING PARTICLES AND CHEMICALS FROM A FLUID SOLUTION
For primary bibliographic entry see Field 5D.
W77-01737

PROCESS FOR RECOVERING USABLE OLIVE PROCESSING LIQUOR FROM OLIVE PROCESSING WASTE SOLUTION,
Department of Agriculture, Washington, D. C. Office of the Secretary.
For primary bibliographic entry see Field 5D.
W77-01741

FOOD PROCESSING RESIDUALS MANAGEMENT A SYSTEMS APPROACH,
Washington Univ., Seattle. Dept. of Civil Engineering.
M. Swayne, and B. Mar.
Completion Report, July 1976. 66 p, 5 fig, 15 tab, 35 ref, append. OWRT A-081-WASH(1), 14-34-0001-6050.

Descriptors: Management, Costs, Optimization, Model studies, *Systems analysis, Foods, *Food processing industry, Regional analysis
Identifiers: *Residuals management(Food), Cost effectiveness, *Fruit and vegetable industry.

A year long study to develop information and apply systems engineering approaches to residuals management in the fruit and vegetable processing industry is reported. The study outputs include: (1) Basic information on residuals generation, control, disposal and costs developed from a data base including information on 738 plants and 19 processing operations, covering 82 different type (2) A methodology for developing flexible modular cost-effectiveness simulation models, includi

rpical costs for 24 residual management methods cluding insplant, end-of-pipe and disposal, (3) e development and testing of both linear and ynamic programming techniques to optimize ant level residual management, and (4) the entification of concepts and methods to extend e data and methods developed in this study for e in regional analyses of residual management.
77-01813

ATER POLLUTION CONTROL ACT OF 1972, CONOMIC IMPACTS, GRAIN MILLING.
evelopment Planning and Research Associates, c., Manhattan, Kans.
r primary bibliographic entry see Field 5G.
77-01954

TRATEGIC ENVIRONMENTAL ASSESSMENT YSTEM, RESIDUALS FORECASTING, AN NALYSIS OF RESULTS,
ternational Research and Technology Corp., ashington, D. C.
r primary bibliographic entry see Field 5G.
77-01958

ATER POLLUTION CONTROL ACT OF 1972, CONOMIC IMPACTS, PILOT STUDY, FIVE DUSTRIES,
nference Board, Inc., New York.
r primary bibliographic entry see Field 5G.
77-01959

ATER POLLUTION CONTROL ACT OF 1972, CONOMIC IMPACTS, CHEMICAL AND AL-ED INDUSTRIES,
ernational Research and Technology Corp., ashington, D.C.
r primary bibliographic entry see Field 5G.
77-01960

ATER POLLUTION ABATEMENT CHNOLOGY, CAPABILITIES AND COSTS, EAM ELECTRIC POWER INDUSTRY, OLUME 1, 2 AND 3).
knekron, Inc., Berkeley, Calif.
r primary bibliographic entry see Field 5G.
77-01983

E METSEP PROCESS FOR THE SEPARA-ON AND RECOVERY OF ZINC, IRON, AND DROCHLORIC ACID FROM SPENT PICKLE QUORS,
tional Inst. for Metallurgy, Johannesburg uth Africa).
primary bibliographic entry see Field 5D.
7-01987

DAK DISPOSES OF WASTE IN SYSTEM AT HELPS PAY ITS WAY,
primary bibliographic entry see Field 5D.
7-01989

YSICAL-CHEMICAL METHODS FOR THE COVERY OF PROTEIN FROM WASTE EF-UENT OF POTATO CHIP PROCESSING,
higan State Univ., East Lansing. Dept. of Crop Soil Sciences.
primary bibliographic entry see Field 5D.
7-01991

W DEVELOPMENTS IN UTILIZATION OF STES FROM FOOD INDUSTRY PLANTS.
primary bibliographic entry see Field 5D.
7-01992

TILLERY WASTES AS FERTILIZER.
primary bibliographic entry see Field 5D.
7-01993

REMOVAL OF POTASSIUM FROM SUGAR INDUSTRY BY-PRODUCTS.
For primary bibliographic entry see Field 5D.
W77-01995

REMOVAL OF HEAVY METALS FROM INDUSTRIAL EFFLUENTS,
National Enforcement Investigations Center, Denver, Colo.
For primary bibliographic entry see Field 5D.
W77-01997

FOAMY COMPLEX FORMATION FOR REMOVING AND RECOVERING OF HEAVY METAL IONS IN DILUTE SOLUTIONS WITH N-MONODECANOYL DIETHYLENETRIAMINE,
Government Industrial Research Inst., Nagoya (Japan).
For primary bibliographic entry see Field 5D.
W77-01998

CONTINUOUS TREATMENT OF WOOL WASH LIQUID - EFFICIENCY INCREASED BY SUPPLEMENTARY CLOSED CONTAMINANT TREATMENT CIRCUIT LINKED TO LIQUID CLEANING CIRCUIT.
For primary bibliographic entry see Field 5D.
W77-02002

LAUNDERING AND DRY-CLEANING,
For primary bibliographic entry see Field 5D.
W77-02005

INDUSTRIALIST VIEW,
Chamber of Commerce of the United States, Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-02050

PANEL 'D' - POWER PLANT AND INDUSTRIAL EMISSIONS AND EFFLUENTS,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 6G.
W77-02055

PANEL 'E' - RESOURCE EXTRACTION,
Geological Survey, Reston, Va. National Center.
For primary bibliographic entry see Field 6G.
W77-02056

3F. Conservation In Agriculture

CHANGE IN THE PROPORTION OF ORGANOPHOSPHORUS COMPOUNDS IN COTTON VARIETY 'TASHKENT-2' UNDER THE EFFECT OF A MOISTURE DEFICIT, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Inst. of Experimental Plant Biology.
KH. S. Samiev, and K. G. Marfina.
S-Kh Biol 10(4), p 620-622, 1975.

Descriptors: *Organophosphorus pesticides, *Cotton, Droughts, Soils, *Moisture deficit, Soil moisture, Crop production.

In cotton cultivar 'Tashkent-2' in the presence of severe soil drought (46% of maximum field capacity), the water content of the leaves decreased and the water-retaining capacity of the tissues increased, which led to a decrease of the P content of the acid-soluble fraction and of nucleic acids (DNA, RNA). After a moderate drought to 57% of capacity) and watering of the plants P was absorbed more intensely, which ultimately weakened the unfavorable effect of a moisture deficit on the physiological activity of the plants. In plants that underwent severe and prolonged drought before watering the metabolism of organophosphorus compounds was activated after watering to a considerably lesser degree. With a soil moisture content of 71% of the maximum field capacity the yield was 44.5 centners/ha and at 46% the yield dropped to 24.4 centners/ha.--Copyright 1976, Biological Abstracts, Inc.
W77-01603

AN AID TO AGRICULTURAL DEW FORECASTING,
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W77-01704

WATERING APPARATUS HAVING AUTOMATIC FEED,
M. Laureau.
U. S. Patent No. 3,972,477, 10 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 146, August 3, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Application equipment, Hydraulic equipment, Remote control.
Identifiers: Standpipes.

A single standpipe is carried on a sled or carriage which is capable of following the path of the fixed waterpipe with hydrants. The standpipe is vertically and axially moveable and is coupled to the watering vehicle by means of a flexible conduit of great length which is wound on a reel having an axial outlet. The return displacement of the standpipe and the sled on which it is supported is assured during periods of stoppage of the watering through the action of the winding of the reel. The continuity in time of the feed under hydraulic pressure for activating the jack for opening the valve and that of releasing the automatic locking means with the hydrant is assured by means of a hydropneumatic accumulator carried by the watering vehicle. An engine provides the drive force necessary to activate the reel during the periods of traction of the sled towards the stopped watering vehicle. A single, fexible small conduit is placed in the interior of the aforesaid flexible conduit and permits by means of a hydraulic assembly to insure the remote control of the disengagement jack of the standpipe from the watering vehicle at the time of encounter with a subsequent hydrant and the remote control from the sled of the stoppage of the engine on the vehicle when the standpipe is engaged on a new hydrant. (Sinha-OEIS)
W77-01714

HYDRAULIC ACTUATED LOAD SENSING GOVERNOR,
Heinzman Engineering Inc., Grand Island, Nebr. (Assignee).
J. C. Groelz.
U. S. Patent No. 3,972,478, 6 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 146, August 3, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Flow control, Water distribution(Applied), Application equipment.

The object of this invention is to provide a hydraulically actuated governor for an inward radial type turbine for a sprinkler vehicle which continually adjusts to fluctuations in load causing only the required amount of water to pass through the turbine and allowing the remainder to bypass the turbine. The amount of water going through the turbine will increase as the load increases. Any abnormally high pressure drops across the hydraulic turbine at the beginning of the sprinkler run when the load is light are eliminated. A simple spring tension adjustment for the sprinkler maching permits the machine to operate over a wide gallonage

range of 150 to 1,000 gallons per minute. This makes it possible for the operator to change the sprinkler nozzle size, without the need to change the turbine size. (Sinha-OEIS)
W77-01715

QUICK-CONNECT FITTINGS FOR A TRICKLE TYPE IRRIGATION SYSTEM,
R. E. Diggs.
U.S. Patent No. 3,973,732, 6 p, 9 fig, 17 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 590, August 10, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Application equipment, Pipes.
Identifiers: Trickle irrigation, Pipe fittings.

This invention provides fittings for a trickle type irrigation system where plastic pipes and the like may be quickly and easily joined together in a secure and leakproof manner without the use of tools, thus resulting in a substantial savings in labor and cost. One form of fitting has a piercing means on one end for penetrating the side of a plastic pipe to make a secure and leakproof connection. The other end is tapered and has an externally serrated surface for quick connection to a plastic pipe. Or a resilient compressible orifice member is clamped between two body members and the body members have concave, tapered adjacent surfaces for engaging the orifice member to press it radially inward to restrict the size of the orifice. (Sinha-OEIS)
W77-01723

SELF-CORRECTING LINEARLY MOVABLE IRRIGATION SYSTEM,
Gifford-Hill and Co., Inc., Lubbock, Tex. (Assignee).
H. Indresaeter.
U.S. Patent No. 3,974,845, 22 p, 14 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 972, August 17, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, *Irrigation efficiency, Water distribution(Applied), Application equipment, Conveyance structures, Controls.

A linearly movable irrigation system includes interconnected power driven irrigation sections supporting a water supply conduit. The sections are capable of moving over a land area and depositing a controlled amount of water. At one extremity of the irrigation system a mobile power and control unit is provided that accepts water from a water supply system and conducts it to the overhead irrigation pipe under sufficient pressure to cause proper distribution of water through sprinkler devices located along the length of irrigation conduit. A power driven pump supported by the power and control unit provides boosting pressure for the water. The power and control unit is adapted to move in proximity to an elongated reference (guide) which may be straight or curved as desired. The power and control unit can sense linear displacement and angular relationship and can induce control signals to the irrigation system to maintain alignment of the system within an acceptable range. Each extremity of the system may remain static while the other moves or while interior sections move. The extremities may also move simultaneously at equal speeds or at different speeds to accomplish controlled movement during irrigation operations. (Sinha-OEIS)
W77-01730

DRIP IRRIGATION VALVE WITH SPRING BIASED PLUNGER,
C. Bentley.
U.S. Patent No. 3,974,853, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 975-976, August 17, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, *Flow control, Water distribution(Applied), Application equipment, Valves.
Identifiers: *Drip irrigation.

The invention provides a valve in which pressure compensation is provided without having to control the characteristics of a seal or other rubber element. A drip irrigation valve comprises an outer member having a passage, an inner member receivable in the passage, a groove in one of the members, and a seal carried by the other of the members. Water can be admitted through an inlet to the passage on one side of the seal to provide a fluid force on the inner member. The seal cooperates with the groove to define a restricted flow path. A spring urges the inner member in a direction to oppose the fluid force on the inner member. The groove is tapered or otherwise has regions of different cross sectional areas so that the flow rate through the restricted flow path can be established by the relative axial positions of the inner and outer members. (Sinha-OEIS)
W77-01731

SOIL MOISTURE AND IRRIGATION STUDIES, II. PROCEEDINGS OF A PANEL.
For primary bibliographic entry see Field 2G.
W77-01735

EFFECT OF SOIL CULTIVATION, FERTILIZERS AND PRECEDING CROPS ON THE ACCUMULATION, RETENTION AND CONSUMPTION OF MOISTURE BY SOIL AND WINTER WHEAT PLANTS, (IN RUSSIAN),
I. E. Bukhar, and T. N. Medvedeva.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk 2, p 85-89, 1975.

Descriptors: *Cultivation, *Fertilizers, *Soil moisture, *Wheat, Moisture content, Crop production, Nutrients.
Identifiers: Winter wheat, Mineral fertilizer, Organic fertilizer.

The accumulation and retention of x moisture in soil, especially under tilled crops, are promoted by periodic deep plowing to 35-38 cm and optimal time of fall plowing. Organic and mineral fertilizers have a favorable effect on water use by wheat plants. New high productivity winter wheat varieties use water more efficiently for the formation of a unit yield.–Copyright 1976, Biological Abstracts, Inc.
W77-01736

OSCILLATING SPRINKLER,
James R. Coson, Fresno, Calif. (Assignee).
J. A. Royer.
U.S. Patent No. 3,977,610, 6 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 949, No 5, p1913, August 31, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Application equipment.
Identifiers: *Oscillating sprinklers.

An oscillating sprinkler having improved provision for confining its discharge to a predetermined arc through which the sprinkler reciprocates, includes a nozzle adapted to direct a stream along an axis in predetermined relation, a pair of cooperative concave vanes, and means for mounting the vanes in fixed spaced relation for integral movement to and from the stream with their concavities placed toward a predetermined fluid path. One of the vanes is adjacent to the nozzle and has an inner end placed in acute angular relation to the axis when in the stream and an opposite end curved laterally from the axis. The other vane is spaced laterally and longitudinally of the axis for the other vane in the direction of curvature and has an inner end substantially parallel to the opposite end of th first vane. Its opposite end is parallel to the inne end of the first vane. (Sinha-OEIS)
W77-01745

PERIPHERAL WATER BALANCE CONTRO FOR CENTER PIVOT IRRIGATION SYSTEM,
Valmont Industries, Inc., Valley, Neb (Assignee).
D. A. Christensen, C. R. Ostrom, and R. L. Frankenstein.
U.S. Patent No. 3,979,062, 14 p, 10 fig, 2 tab, 7 re Official Gazette of the United States Patent O fice, Vol 950, no 1, p 191, September 7, 1976.

Descriptors: *Patents, *Irrigation, *Irrigatic practices, *Irrigation efficiency, *Contr systems, Conveyance structures, Distributic systems, Water distribution(Applied), Applicatic equipment.
Identifiers: Sensors.

A water balance control for a pivotal end boo connected to the outer end of a center pivot irrig tion system to irrigate peripheral areas (e.g., co ners) beyond the periphery of the circular ar covered by the main conduit of the system described. The water balance control comprises sensing mechanism for sensing both the angul position of the boom and its direction of mov ment (Swing-out or swing-in) relative to the end the main conduit. Primary control circuits, act ated by the sensing mechanism, turn the boo nozzles on and off, depending on the angular po tion of the boom. Secondary control circuits, al actuated by the sensing mechanism operate t primary controls in accordance with two differe programs, one for swing-out movement and t other for swing-in movement. A speed control f the main conduit, also actuated by the sensi mechanism, is included. (Sinha-OEIS)
W77-01754

GOVERNOR FOR ROTARY SPRINKLER,
Rain Bird Sprinkler Mfg. Corp., Glendora, Ca (Assignee).
B. Fortner.
U.S. Patent No. 3,979,066, 7 p, 9 fig, 3 ref; Offic Gazette of the United States Patent Office, V 950, No 1, p 192, September 7, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler rigation, *Irrigation practices, *Irrigation effici cy, Control, Flow control, Water distri tion(Applied), Application equipme *Governors.
Identifiers: *Rotary sprinklers.

A governor device for rotary sprinklers is p vided which is reliable and effective in controll and reducing the rotational speed of the sprink in order to increase the useful life of the sprink and increase the size of the area irrigated by sprinkler. The governor is relatively simple structure and has no moving parts. The gover includes a reaction vane which is normally pla out of the path of the stream ejected by the sp kler when the sprinkler is not rotating, but wh will be hit by the stream when the sprinkler rota above a desired speed. When the stream hits vane a reverse torque is produced which slows rate of sprinkler rotation within relatively w ranges. By selecting the lateral location of the v relative to the stream path, the speed of rotat can be controlled. (Sinha-OEIS)
W77-01755

DRIP OR TRICKLE EMITTER FOR USE DRIP OR TRICKLE IRRIGATION,
M. Lemelshtrich.
U.S. Patent No. 3,979,070, 5 p, 6 fig, 4 ref, Offi Gazette of the United States Patent Office, 950, no 1, p 194, September 7, 1976.

escriptors: *Patents, Irrigation, *Irrigation prac-ces, *Irrigation efficiency, Water distribu-on(Applied), Flow control, Application equip-ent.
lentifiers: *Drip irrigation, *Trickle emit-rs(Irrigation).

drip or trickle emitter is provided for an irriga-on device. The flow restrictor is composed of a sc which has two parts which fit into or onto one nother in intimate contact. The interior of the evice provides a meandering path for the flow d has inlets leading into the path and outlets at e end of the path. A specific feature of the inven-on is the manner in which the two parts, which e press fittedly connected with one another, are aintained in the connected position due to a spe-al arrangement and due to the shape of the con-cted parts at the contacting regions, urging one rt into intimate contact with the other in axial rection. (Sinha-OEIS)
77-01756

GPM. IT WORKS IF YOU HAVE ENOUGH ELLS,
r primary bibliographic entry see Field 4B.
77-01762

EARLY 50,000 NEBRASKA WELLS CAUSING ME CONCERN.
r primary bibliographic entry see Field 4B.
77-01765

FFUSE AGRICULTURAL POLLUTION: THE CONOMIC ANALYSIS OF ALTERNATIVE NTROLS,
isconsin Univ. - Madison. Dept. of Agricultural conomics.
r primary bibliographic entry see Field 5G.
77-01810

MULATING FARM IRRIGATION SYSTEM ERGY REQUIREMENTS,
egon State Univ., Corvallis. Water Resources search Inst.
B. Wensink, J. W. Wolfe, and M. A Kizer.
egon Water Resources Research Institute, Cor-llis, Completion Report WRRI-44, August 1976. 5 p, 28 fig, 3 tab, 23 ref, 2 append. OWRT A-033-RE (1).

scriptors: Irrigation *Energy, *Farm manage-nt, *Irrigation systems, Performance, Opera-ns, Consumptive use, Agriculture, *Sprinkler gation, *Irrigation practices.
ntifiers: *Trickle irrigation, *Gravity irrigation stems.

e development of the energy crisis has resulted close monitoring of depletable energy resources the United States. Within the agricultural sec-, irrigation is a large consumer of energy, with potential of using several times more energy n all other agricultural field operations. A better derstanding of how energy is used by different gation systems could facilitate more efficient of energy by one of the largest energy con-ners in agriculture. This study attempts to eval-e the total amount of non-renewable energy ources consumed in the irrigation process. Five rtable and permanent sprinkler system types, s trickle and gravity irrigation systems, were died. An evaluation of the energy required to nufacture, install, operate, and transport the uipment for an entire irrigation season was in-ded in the analysis. This evaluation was con-cted in a variety of operating situations, with ying acreages, consumptive use rates, and total gation requirements.
7-01816

ALTERNATIVES IN AREA MANAGEMENT OF GROUNDWATER,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4B.
W77-01819

WATER SUPPLY AND AMINO ACID COMPOSITION OF SUNFLOWER PROTEINS, (IN RUSSIAN),
N. S. Osik.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina 3, p 25-27. 1975.

Descriptors: Water supply, *Amino acids, Crops, Cultivation, Irrigation, *Proteins, *Crop production, *Moisture deficit.
Identifiers: *USSR(Steppe zone), *Sunflower crops.

The sunflower is cultivated mainly in the steppe zone (USSR), where the main factor limiting productivity is the lack of moisture. An improvement of the water supply of sunflowers enhances the productivity and oil content of the seeds, the constituent proteins in total protein and the amino acid composition.--Copyright 1976, Biological Abstracts, Inc.
W77-01878

SOME MOLECULAR MECHANISMS RETAINING WATER IN PLANT CELLS, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
For primary bibliographic entry see Field 2I.
W77-01881

CHANGES IN NITROGEN CONTENT IN PERENTIAL FORAGE GRASSES IN DIFFERENT GRASS MIXTURES, (IN AZERBAIJANI),
T. A. Mamedov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 1, p 51-55, 1974.

Descriptors: *Proteins, *Nitrogen compounds, *Alfalfa, *Barley, *Legumes, *Irrigation, Grasses, Forages, Cereal crops, Forage grasses.
Identifiers: Apsheron Peninsula, Azerbaidzhan SSR, USSR.

The change in the content of various fractions of N compounds in forage alfalfa and bulbous barley in pure and mixed grass stands was studied on the Apsheron Peninsula of the Azerbaidzhan SSR (USSR). Perennial forage grasses in a mixed stand (1:2) in comparison with pure sowings were distinguished by a greater content of total and protein N. In grass mixtures of legumes and cereals and in pure sowings of legumes, the legume component had a greater content of protein N. Irrigation favored accumulation of N compounds in forage grasses in a pure sowing and in legume and cereal mixtures.--Copyright 1975, Biological Abstracts, Inc.
W77-01886

THE HYDROLOGY OF PREHISTORIC FARMING SYSTEMS IN A CENTRAL ARIZONA ECOTONE,
Southern Illinois Univ., Carbondale.
G. J. Gumerman, J. A. Hanson, D. Brew, K. Tomoff, and C. S. Weed.
Final Report to NASA, Lyndon B. Johnson Space Center, Houston, Tex., 1975. 270 p. 51 fig, 10 tab, 27 ref, 2 append. NAS 9-14610.

Descriptors: *Paleohydrology, *Adaptation, *Remote sensing, *Archaeology, *Southwest U.S., *Farms, Satellites(Artificial), Terrain analysis, *History, Hydrology, *Arizona, Dating, Biology, Geology, Semiarid climates, Land use, Water resources, Water management(Applied), Available water, Watersheds(Basins), Environment, Mapping, Arid lands(Southwest US).
Identifiers: *Prehistoric farming systems ecotone.

Hydrologists, geologists, biologists and archaeologists were involved in an interdisciplinary study of man's adaptation to a selected portion of the semiarid Southwest. Remote sensing data was utilized. The goals of the project were to define the environmental settings of the test area, and in doing so define the adaptations made by both prehistoric and historic populations of the test area. The principle question asked by the Central Arizona Ecotone project was how did prehistoric man adapt to the semiarid desert in south-central Arizona and to what extent did his creation of land management and water control system manipulate that environment. The findings from each discipline are presented separately and overall conclusions discussed in detail. (Jamail-Arizona)
W77-01891

FLOW RESISTANCE AND INTAKE CHARACTERISTICS OF IRRIGATION FURROWS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
M. K. Ramsey.
Master of Science Thesis, 1976. 13 fig, 58 tab, 25 ref, 7 append.

Descriptors: *Flow resistance, *Irrigation efficiency, *Irrigation effects, *Furrow irrigation, *Furrows, Irrigation, Discharge(Water), Infiltration, Water delivery, Furrows, Mathematical models, Irrigation water, Intakes, Water management(Applied).

Seven irrigations were conducted on a precision field furrow. During five, discharge was reduced. Inflow, outflow, water surface elevations, soil surface elevations, and furrow geometry were measured. Data are also presented for advance and recession times, water surface slopes, flow depths, average flow velocities, and flow retardance coefficients. Retardance coefficients were calculated from steady, uniform flow equations. Methods for the determination of an infiltration function are also presented. Results indicate a linear relationship between intake rates and wetted perimeter, and that resistance to flow increases in effect as flow depth is decreased. Also, infiltration functions developed with advance data are not accurate during the continuing phase, and infiltration functions developed from ponded furrow tests underestimate infiltration when irrigation is conducted within the same furrow. There is little difference between infiltration depths predicted with either Kostiakov or the Philip equations during the advance and continuing phases. (Jamail-Arizona)
W77-01893

STRATEGIES TO IMPROVE WATER MANAGEMENT IN MEXICAN IRRIGATION DISTRICTS: A CASE STUDY IN SONORA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
E. Palacios-Velez.
Ph.D. Dissertation, 1976. 19 fig, 20 tab, 40 ref, 3 append.

Descriptors: *Water management(Applied), *Irrigation efficiency, *Irrigation districts, *Linear programming, *Mexico, Water demand, Governments, Mathematical models, Rivers, Dams, Water quality, Crop production, Soil moisture, Water utilization, Saline water, *Arid lands.
Identifiers: *Sonora(Mex).

A study was conducted to analyze the operation of an existing irrigation district in order to (1) search for methodologies to evaluate the efficiency of water use and classify the problems related to water issues according to their relative importance; (2) find economic criteria to optimize the use of scarce natural resources, mainly water and soil; and (3) search for practical operating rules which lead to improving the efficiency of water use. Complex mathematical relationships have been simplified to meet the purpose of providing

information that can be understood by non-technical decisionimakers. These models are tested against empirical observations made in Sonora, Mexico. The results are presented and recommendations made for improving irrigation water use. (Jamail-Arizona)
W77-01894

PROVIDING FOR PROVIDENT DOGONS,
For primary bibliographic entry see Field 3B.
W77-01896

EFFECT OF SOIL MOISTURE ON NODULATION OF COWPEA AND HYACINTH BEAN,
Khartoum Univ., (Sudan). Faculty of Agriculture.
For primary bibliographic entry see Field 2I.
W77-01902

COLORADO RIVER BASIN DEVELOPMENT AND ITS POTENTIAL IMPACT ON TRIBAL LIFE,
Colorado Univ., Boulder. Dept. of Anthropology.
For primary bibliographic entry see Field 6B.
W77-01903

APPLIED CLIMATOLOGY AND FOOD PRODUCTION: THE CASE OF GRAPEFRUIT QUALITY IN THE RIO GRANDE VALLEY OF TEXAS,
Texas A and I Univ., Kingville.
J. Norwine, and J. Fucik.
Association of American Geographers, Proceedings, Vol. 7, p 169-174, 1975. 4 tab, 9 ref.

Descriptors: *Grapefruit, *Citrus fruits, *Climatic data, *Agroclimatology, *Crop production, Meteorology, Subhumid climates, *Texas, Climates, Precipitation(Atmospheric), Climatology, Evaporation, Irrigation, Moisture availability, *Evaportranspiration, Solar radiation, Temperature, Rio Grande River.
Identifiers: Rio Grande Valley(Tex).

A study was conducted in the semiarid Rio Grande Valley of Texas to increase knowledge of climatic influences upon citrus fruit. Climatological variables were monitored over a ten year period and correlated with weekly measurements of ruby red grapefruit diameters. Previous studies of climatic influences upon citrus fruits have suggested that grapefruit size harvest is positively correlated with precipitation in the spring and summer and with temperature in spring and negatively correlated with high temperatures. In this study not one moisture term (precipitation, actual evaportranspiration, and potential evaportranspiration) was related significantly to grapefruit diameter in any month. This was due to the frequent application of irrigation water during the growing season. Because of extremely high evaporation rates and limited precipitation during the summer in the Rio Grande Valley, nearly all commercial crops are irrigated. Without such water it is likely that moisture availability would be a critical factor. Conclusions are that: (1) warm days and nights in April and several earlier months are conducive to large fruits six months later; (2) temperatures and solar radiation levels in August and September are excessive for most efficient fruit growth, and (3) regression equations based upon climate alone may be used with confidence to predict fruit quality at harvest. (Jamail-Arizona)
W77-01905

USE OF CONSTANT LEVEL JAIN EVAPORIMETER IN SCHEDULING IRRIGATION,
Udaipur Univ. (India). Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W77-01907

A TRAGEDY OF THE COMMONS IN THE SAHEL,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 6G.
W77-01908

EVALUATION OF AGRICULTURAL ADJUSTMENT TO IRRIGATION WATER SALINITY: A CASE STUDY FOR PINAL COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3C.
W77-01909

RESPONSE OF COTTON TO NITROGEN AND WATER IN A TROPICAL ENVIRONMENT. III. FIBRE QUALITY,
Commonwealth Scientific and Industrial Research Organization, Kununurra (Australia). Div. of Land Research.
A. B. Hearn.
Journal of Agricultural Science, Vol. 86, No. 2, p 257-269, April, 1976. 7 fig, 9 tab, 15 ref.

Descriptors: *Cotton, *Fibers(Plant), *Fiber crops, *Irrigation practices, Agriculture, Fertilizers, Crop production, Irrigation efficiency, Nitrogen compounds, Irrigation, Irrigation, Irrigation water, Tropical regions.

Experiments were conducted to determine the effects of irrigation and fertilizer application on the fiber quality of cotton. In two experiments three dates for time of last irrigation were combined factorially with four rates of application of nitrogen fertilizer and two varieties of cotton. Early termination of watering combined with heavy application of nitrogen decreased fiber strength, micronaire and yarn strength. In two other experiments three frequencies of watering were combined factorially with several rates of application of nitrogen. Frequent watering combined with heavy application of nitrogen decreased uniformity of fiber length, micronaire and yarn strength and appearance. In both experiments application of nitrogen increased fiber length. The practical significance of these experiments to farmers is also discussed. (Jamail-Arizona)
W77-01910

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

SIGNIFICANCE OF HYGIENIC INVESTIGATIONS IN SOLVING PROBLEMS OF PROTECTING SURFACE WATERS AT THE CURRENT STAGE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR)
For primary bibliographic entry see Field 5G.
W77-01553

TRANSIENT DRAINAGE WITH NONLINEARITY AND CAPILLARITY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W77-01633

SOME CONSIDERATIONS ON THE ESTABLISHMENT OF THE HIGH AND LOW WATER LEVEL PLANES IN THE GREAT LAKES AREA,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2H.
W77-01637

PROCEEDINGS OF THE NATIONAL WETLAND CLASSIFICATION AND INVENTORY WORKSHOP, 1975.
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 079, Price codes: A16 in paper copy, A01 in microfiche. Conducted by The Wildlife Management Institute. Held at University of Maryland, College Park, Maryland, July 20-23, 1975. 248 p., Addendum of 110 p. July 1976. Edited by J. Henry Sather, Western Illinois University.

Descriptors: *Wetlands, *Classification, *Aquatic habitats, *Marsh management, *Conferences, Marshes, Marsh plants, Animal groupings, Terrestrial habitats, Wildlife habitats, *Habitats, Plant groupings, *Ecosystems, Environment.
Identifiers: *National Wetlands Inventory, Wetlands classification.

Workshop participants represented most Federal and State agencies and private organizations intimately involved in work with wetlands. Participants described the current involvement of their organizations in wetland work. The major portion of the workshop was devoted to a critical examination of a proposed new wetland classification system. Suggestions emanating from the workshop were incorporated in a revised draft of the classification system. A copy of the revised draft entitled 'Interim classification of Wetlands and Aquatic Habitats of the United States,' is appended to the Proceedings. The interim classification system will now be subjected to intensive field testing prior to the preparation of a final revision. (FWS)
W77-01682

A MATHEMATICAL MODEL FOR PREDICTING RIVER TEMPERATURES-APPLICATION TO THE GREEN RIVER BELOW FLAMING GORGE DAM,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
J. J. Sartoris.
Report REC-ERC-76-7, April 1976. 28 p, 6 fig, 3 tab, 10 ref, 4 append.

Descriptors: *Temperature control, Computer programs, Intakes, *Mathematical models, Fish conservation, Utah, Colorado, Wyoming, *Reservoir releases, Reservoirs, River forecasting, *Water temperature, Computer models.
Identifiers: Empirical equations, *Green River(Utah-Colo), Flaming Gorge Reservoir(Utah-Wyo).

The purpose was to evaluate the effect of selective withdrawal modifications at Flaming Gorge Dam on temperatures in the Green River downstream. A computerized mathematical temperature model incorporating the conservation of heat equation and an equilibrium temperature approach to heat exchange, was developed. The model was calibrated, using 1974 average daily meteorological and hydrological data, to observed temperatures at three river stations, covering a total distance below the dam of 70.0 kilometres (43 river miles). The average monthly error between predicted and observed mean daily river temperatures at these stations ranged from 0 to -1.2C (0 to 2.2F). The calibrated model was used to simulate river temperatures for the case of only two pen stock intake structures modified for selective withdrawal and for all three intakes modified. Simulation results indicate that, while the two-intake modification strategy would result in river temperatures significantly nearer the optimum fishery range than those recorded in 1974, operation with all three intakes modified would generally result in optimum fishery temperatures from May through September. The computer model developed could be adapted to a variety

ta and stream conditions. (Bureau of Reclama-
n)
77-01684

SSESSMENT OF WATER AND RELATED
AND RESOURCES, 1975. INITIAL IDENTIFI-
ATION OF WATER AND RELATED LAND
ROBLEMS IN NEW ENGLAND,
ew England River Basins Commission, Boston,
ass.
r primary bibliographic entry see Field 6G.
77-01688

HE ILLINOIS COASTAL ZONE MANAGE-
ENT PROGRAM. FIRST YEAR WORK
RODUCT: VOLUME I; THE LEGAL
RAMEWORK: LAKE MICHIGAN AND ITS
IORE,
r primary bibliographic entry see Field 6E.
77-01689

HE RIVER'S REACH. CONNECTICUT RIVER
PPLEMENTAL FLOOD MANAGEMENT
UDY. OUTDOOR RECREATION IMPACTS.
IASE II. PART V,
reau of Outdoor Recreation, Philadelphia, Pa.
ortheast Regional Office.
r primary bibliographic entry see Field 6B.
77-01694

ONNECTICUT RIVER BASIN PROGRAM.
IASE II. WATER QUALITY IMPACT
'ALUATIONS ON FLOOD PROTECTION
EASURES FOR THE CONNECTICUT RIVER
PPLEMENTAL STUDY.
vironmental Protection Agency, Boston, Mass.
r primary bibliographic entry see Field 5G.
77-01695

REPORT TO THE NEW ENGLAND RIVER
SINS COMMISSION ON NON-STRUCTURAL
EASURES FOR FLOOD PLAIN AND FLOOD
AMAGE MANAGEMENT WITH APPLICA-
ON TO THE CONNECTICUT RIVER BASIN
PPLEMENTAL FLOOD MANAGEMENT
UDY. PHASE II. THE FORMULATION AND
'ALUATION OF SPECIFIC ALTERNATIVES,
eney, Miller, Ellis and Associates, Inc., Put-
n, Conn.
r primary bibliographic entry see Field 6F.
77-01696

RTAIN CHARACTERISTIC FEATURES OF
OWERING AND POLLINATION IN
CKWEEDS (LEMNACEAE S. GRAY),
. Ivanova.
SA TT F-16,483, August 1975. 21 p. Translated
m Botanicheskiy Zhurnal, Vol. 55, p. 649-659,
y 1970. 5 fig, 1 tab, 22 ref.

scriptors: *Palynology, *Aquatic weeds,
oating plants, Flowering, Pollen, Reproduc-
n, Speciation, Water chemistry, Aquatic weed
trol, Water pollution control, Ponds.
ntifiers: *Duckweed, Wolffioidea, Lem-
deae.

e palynological mechanisms of the subfamilies
lffioideae and Lemnoideae of the family Lem-
eae are detailed based on observations during
8 of flowering Lemna in Novgorod, USSR,
ds. Because of Lemna's extremely rare flower-
habit little is known and a great deal of conjec-
e exists in the literature. During the flowering
iod of L. trisulca and L. gibba, the chemical
perties of the water under the plants were com-
ed with artificial solutions and showed dif-
ences in content of macro- and microelements.
e concentrations of calcium and magnesium
s and sulfates in the natural solution were 3 to
times greater, whereas the magnesium and
per contents were 5 to 10 times less, and no zinc was present. The water beneath L. gibba contained no manganese. The conclusions are that cross-pollination is possible due to the fact that the stigma becomes receptive to pollen long before the staminode of the same plant emerges. Self-pollination is possible because the stigma retains viability even after maturation of the pollen of the same plant. If cross pollination had not yet occurred, the stigma turns its mouth upward beneath the anthers of its own staminode, thus duckweeds show great plasticity of reproductive apparatus and are capable of using insects, the wind, as well as autogamy. (Auen-Wisconsin)
W77-01778

GRAPHIC DISPLAY OF WATER RIGHTS AND WATER RESOURCE INFORMATION FOR THE YAKIMA RIVER BASIN AS AN AID TO DECISION-MAKING,
Central Washington State Coll., Ellensburg. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W77-01808

NITRATE AND PHOSPHATE: TIME-TREND CONCENTRATIONS IN SELECTED KANSAS STREAMS,
Kansas Water Resources Research Inst. Manhattan.
For primary bibliographic entry see Field 5B.
W77-01818

EVALUATION OF EFFECTIVENESS OF RESERVOIR DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-01821

VERIFICATION OF HYDROELASTIC SIMILITUDE CRITERIA,
Research Inst. for Water Resources Development, Budapest (Hungary). Dept. for Hydromechanics.
For primary bibliographic entry see Field 8B.
W77-01880

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W77-01885

MODELE D'AMENAGEMENT ET DE GESTION D'UN GRAND BASSIN HYDROGRAPHIQUE, (A MODEL FOR THE DESIGN AND MANAGEMENT OF A LARGE HYDROGRAPHIC BASIN),
Ecole Nationale Superieure des Mines de Paris, Fontainebleu (France). Center for Geological Information.
G. De Marsily, P. Hubert, L. Paschini, and P. Ramain.
Hydrological Sciences--Bulletin, Vol. 21, No. 1, p 69-76, March 1976. 2 fig. (Paper from Symposium and Workshops--Bratislava, September 1975: Application of Mathematical Models in Hydrology and Water Resources Systems).

Descriptors: *River basins, *Management, *Forecasting, *Water resources, Design, Economics, Linear programming, Optimization, Water policy, Decision making, Water quality control, Mathematical models, Systems analysis.
Identifiers: *Hydrographic basins.

The forecasting model presented herein constitutes the basic element for the methodology for the design and management scheme proposed. Industrialized countries' water is not presently a limiting factor in economic and social development, although the deterioration of water quality does pose some problems. A dual objective will therefore be set for water management: the safeguarding and perhaps improvement of water quality as well as satisfying the needs of the users. The monetary criterion, with the dangers associated with it (notably the selection of a rate of realization) would in itself only reflect the 'capital' of a water management project and therefore must not be retained as the sole criterion for choice. The search for the management solution at the least cost has little chance of satisfying each of the numerous decision makers interested in the management of a basin. Efforts are thus directed to the determination of 'satisfactory' solutions, each of them being optimal compared with an explicit water policy. With these satisfactory solutions are associated technical, ecological and financial parameters which allow the decision makers to compare solutions and finally to express a choice. (Bell-Cornell)
W77-01887

FLOW RESISTANCE AND INTAKE CHARACTERISTICS OF IRRIGATION FURROWS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3F.
W77-01893

PROVIDING FOR PROVIDENT DOGONS,
For primary bibliographic entry see Field 3B.
W77-01896

TWENTY-SIX-YEAR CYCLICAL DISTRIBUTION OF DROUGHT AND FLOOD IN CEARA, BRAZIL,
California State Univ., Fresno.
For primary bibliographic entry see Field 2B.
W77-01897

FLASH FLOODS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2E.
W77-01933

COLLECTION AND PROCESSING SYSTEM OF HYDROLOGICAL DATA DURING FLASH FLOODS ON THE RIVER YODO,
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 2E.
W77-01934

OPERATIONAL ARRANGEMENT OF RAIN-GAUGE STATIONS IN FORECASTING FLASH FLOODS,
Kyoto Univ. (Japan).
T. Ishihara, and Y. Ishihara.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 73-80, 1974. 5 fig, 6 ref.

Descriptors: *Flash floods, *Flood forecasting, *Networks, *Watersheds(Basins), Mathematical models, Hydrographs, Rivers, Floods, Regional analysis, Runoff, Rainfall-runoff relationships, Network design, Hydrologic data, Design, River basins.
Identifiers: *Japan.

A flash flood is caused by a heavy rainfall concentrated in a short time and a small area. The predominant components of runoff during such a flood result from overland flow and prompt interflow. These facts suggest that the efficient arrangement of rain gage stations in forecasting flash floods must be found with consideration of areal variation of rainfall and the topographical features of a river basin. After discussing the formation process of a flash flood hydrograph by introducing the geomorphological knowledge of a river basin and the empirical characteristics of heavy rainfalls, it was shown, using the example of a

Japanese river, that several rain gage stations can be arranged efficiently for flash flood forecasting. It was concluded that two or three operationally arranged rain gage stations are the minimum required for a river basin of less than several hundred square kilometers area; five or perhaps eight stations are necessary for a larger river basin. (See also W77-01933) (Humphreys-ISWS)
W77-01938

WARNING SYSTEM FOR SEVERE FLOODS,
Water Survey of Canada, Calgary (Alberta).
For primary bibliographic entry see Field 7B.
W77-01939

FLOOD MEASUREMENTS IN AN URBAN ENVIRONMENT: A DATA USER'S VIEWPOINT,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
E. F. Schulz, N. S. Grigg, L. S. Tucker, and W. J. Shoemaker.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 87-92, 1974. 12 ref.

Descriptors: *Urban runoff, *Cities, *Flood control, *Flood data, Measurement, Hydrologic data, Urban hydrology, Urban drainage, Flood protection, Hydrology, Model studies, Management, Planning.

The need for flood measurements in an urban environment was shown, and the role of a local flood control district in helping local governmental entities was outlined. The value of a coordinated plan in the preparation, execution, and operation of flood control measures was discussed. The need for high-quality flood data was emphasized. The problems of measuring floods on small, ephermeral streams in an urban environment were discussed. The possible uses of the data were outlined. It was concluded that flood measurements are essential in an urban environment for: (1) planning purposes, (2) developing model parameters, (3) project operations, and (4) public relations and assessment of project performance. (See also W77-01933) (Humphreys-ISWS)
W77-01940

THE OPERATIONAL USE OF DIGITAL RADAR DATA FOR FLASH FLOOD MONITORING,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 7B.
W77-01941

SYSTEMS FOR PREPARING TIMELY FLASH FLOOD WARNINGS,
National Weather Service, Silver Spring, Md. Office of Hydrology.
M. M. Richards, and R. A. Clark.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 106-109, 1974. 1 fig.

Descriptors: *Flash floods, *Warning systems, *Monitoring, *Flood forecasting, Forecasting, Control systems, Data collections, Data transmission, Instrumentation, Floods.

In the United States, floods in which water levels rise very rapidly are commonly referred to as flash floods. The techniques used to forecast flash floods are basically no different from those required for floods in which water levels rise more slowly. The essential difference is the need to speed up the data collection, forecasting, and dissemination processes when dealing with flash floods. The following 4 ways were suggested to speed up flash flood forecasting: (1) use automation, (2) assist the community in setting up its own flash flood forecasting system, (3) install a flash flood alarm, and (4) use generalized flood watches and warnings. (See also W77-01933) (Humphreys-ISWS)
W77-01942

FLASH FLOODS IN INDIA,
Central Water and Power Commission, New Delhi (India).
For primary bibliographic entry see Field 2E.
W77-01943

THE USE OF REMOTE SENSING SYSTEMS IN MONITORING DESERT FLOODS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
For primary bibliographic entry see Field 7B.
W77-01944

SNOW DAMAGE IN ARIZONA PONDEROSA PINE STANDS,
Forest Service (USDA), Tempe, Ariz.; Forest Hydrology Lab.; and Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
P. F. Ffolliott, and J. R. Thompson.
USDA For. Serv. Res. Note RM-322, 2 p.

Descriptors: *Forest management, *Snow, *Ponderosa pine, *Arizona.
Identifiers: *Snow damage, *Thinning(Trees).

Snow damage in three cutover ponderosa pine stands was evaluated following a year of record snowfall in north-central Arizona. Susceptibility to bending decreased as diameter at breast height increased. Dense sapling stands suffered significantly more damage than thinned areas. Thinning early in the sapling stage is recommended to reduce the snow damage potential. (Forest Service)
W77-01949

WATER QUALITY ANALYSIS, UPPER MISSISSIPPI RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif
For primary bibliographic entry see Field 5G.
W77-01953

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, COLUMBIA RIVER.
Parametrix, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-01955

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, UPPER RIO GRANDE,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W77-01956

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HOUSATONIC RIVER,
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
For primary bibliographic entry see Field 5G.
W77-01957

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GUADALUPE-SAN ANTONIO RIVER BASIN,
Water Resource Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W77-01962

ENVIRONMENTAL IMPACT ASSESSMENT WATER QUALITY ANALYSIS, ST. JOH RIVER ESTUARY (FLORIDA),
Atlantis Scientific, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W77-01964

WATER QUALITY ANALYSIS, THE POTOMA RIVER.
GKY and Associates, Alexandria, Va.
For primary bibliographic entry see Field 5G.
W77-01968

ENVIRONMENTAL IMPACT ASSESSMENT WATER QUALITY ANALYSIS, HAWAII.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01970

ENVIRONMENTAL IMPACT ASSESSMENT WATER QUALITY ANALYSIS, PUERTO RICO
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01971

ENVIRONMENTAL IMPACT ASSESSMEN WATER QUALITY ANALYSIS, SOUT PLATTE.
Tetra-Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01972

WATER POLLUTION CONTROL LAW 1972, REGIONAL IMPACTS, KANAWH RIVER.
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-01975

WATER POLLUTION CONTROL ACT OF 19 ENVIRONMENTAL IMPACT ASSESSMEN SANTEE RIVER BASIN.
Academy of Natural Sciences of Philadelphia, P
For primary bibliographic entry see Field 5G.
W77-01976

ENVIRONMENTAL IMPACT ASSESSMEN WATER QUALITY ANALYSIS, ST. JO RIVER (MAINE).
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-01977

WATER POLLUTION CONTROL ACT OF 19 REGIONAL IMPACTS, DELAWARE RIV BASIN, (PARTS 1, 2, AND 3).
Betz Environmental Engineers, Inc., Plymo Meeting, Pa.
For primary bibliographic entry see Field 5G.
W77-01978

WATER POLLUTION CONTROL ACT OF 19 REGIONAL IMPACTS, CHATTAHOOCH FLINT-APALACHICOLA, (PARTS 1 AND 2).
Hammer, Siler, George Associates, Atlanta, Ga
For primary bibliographic entry see Field 5G.
W77-01980

WATER POLLUTION CONTROL ACT OF 19 REGIONAL IMPACTS, OHIO RIVER BAS (VOLUMES 1 AND 2).
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-01981

SURFACE WATER SUPPLY OF THE UNI STATES, 1966-70: PART 7. LOWER MISSIS

I RIVER BASIN--VOLUME 1. LOWER MISSIS-PPI RIVER BASIN EXCEPT ARKANSAS IVER BASIN.
eological Survey, Reston, Va.
or primary bibliographic entry see Field 7C.
77-02009

BLIOGRAPHY AND SELECTED ABSTRACTS F REPORTS ON WATER RESOURCES AND ELATED SUBJECTS FOR ARKANSAS HROUGH 1975,
eological Survey, Little Rock, Ark.
or primary bibliographic entry see Field 10C.
77-02014

OTOPIC HYDROLOGY IN THE AMAZONIA RELATIVE DISCHARGES OF THE NEGRO ND SOLIMOES RIVERS THROUGH O-18 ONCENTRATIONS,
entro de Energia Nuclear na Agricultura, Sao ulo (Brazil); and Geological Survey, Denver, lo.
or primary bibliographic entry see Field 2E.
77-02016

MULATION OF FOREST CHANGES RE-ATED TO HYDROLOGIC VARIABLES IN IE ATCHAFALAYA RIVER BASIN, LOUI-ANA,
eological Survey, Jackson, Miss.
E. Jennings, and C. P. O'Neil.
urnal of Research of the U.S. Geological Sur-y, Vol 4, No 4, p 481-489, July-August 1976. 3 , 7 tab, 5 ref.

escriptors: *Forest watersheds, Hydrologic pro-rties, *Vegetation effects, *Growth rates, lodel studies, Regression analysis, Statistical thods, Mixed forests, Succession, Swamps, nd use, Surface waters, Evaluation, Environ-ntal effects, Watershed management, ouisiana.
ntifiers: *Atchafalaya River Basin(La).

sults of forest-trend modeling from one data set the Atchafalaya River basin, Louisiana, show t predicted forest acreage totals for 16 forest es agree within 30 percent of actual values in o-thirds of the comparisons. A forest-trend ulation model based on statistical regression ations of forest and hydrologic variables and nstrained by forest succession concepts was veloped using observed data from twenty-four quare-mile (20.74-square-kilometer) quadrats. rest and hydrologic data at each quadrat were mpled in time at three 4-mile (6.44-kilometer)-le strips across the basin. The model predicts nges in forest-type acreages due to hydrologic nge in time steps, or forest acreage transition, 21 years. Further basin-wide quadrat simula-ns are planned using hydrologic input data from ow-sediment model of the basin currently being veloped. (Woodard-USGS)
7-02019

OOD CHARACTERISTICS OF STREAMS IN VYHEE COUNTY, IDAHO,
ological Survey, Boise, Idaho.
primary bibliographic entry see Field 2E.
7-02027

ERMAL MODELING AND ITS RELATION CANAL EVAPORATION,
ological Survey, Bay St. Louis, Miss.
primary bibliographic entry see Field 2D.
7-02029

TER-TEMPERATURE CHANGES WNSTREAM FROM A MAJOR RESERVOIR CANNONSVILLE, N.Y.,
ological Survey, Harrisburg, Pa., and Geologi-Survey, Reston, Va.
E. Fish, and N. Yotsukura.

Paper presented at Irrigation and Drainage Specialty Conference, ASCE, Ottawa, Ontario, Canada, July 21-23, 1976. 18 p, 7 fig, 1 tab, 7 ref.

Descriptors: *Water temperature, *Reservoir releases, *Streamflow, *Heat transfer, *Delaware River, *New York, Mixing, Convection, Data collections, Instrumentation.
Identifiers: *Cool water releases, Ambient temperature, *Cannonsville Reservoir(NY).

The mean temperature of cool bottom water released from Cannonsville Reservoir, Cannonsville, N.Y., into the Delaware River basin at rates of 500-2,000 cubic feet per second (15-60 cubic meters per second) during summer months increased 13C Celsius in reaching ambient temperature about 65 miles (105 kilometers) downstream. The relation between temperature increase and distance can be approximated by an exponential equation in which a constant is used for the coefficient of heat exchange at the air-water interface. The optimum value for the coefficient was 0.00004 feet per second. (Woodard-USGS)
W77-02030

HYDROLOGIC UNIT MAP--1974, STATE OF NORTH DAKOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-02031

WATER HYACINTHS AND ALLIGATOR WEEDS FOR REMOVAL OF SILVER, COBALT, AND STRONTIUM FROM POLLUTED WATERS,
National Space Technology Labs., Bay St. Louis, Miss.
For primary bibliographic entry see Field 5G.
W77-02037

OPTIMIZING SELECTION OF MARINE RETAINING WALLS,
Mueser, Rutledge, Wentwork and Johnston, New York.
For primary bibliographic entry see Field 8F.
W77-02072

4B. Groundwater Management

SHUNT LINE METERING SYSTEM FOR IRRIGATION WELLS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W77-01623

QUALITY OF GROUND WATER IN THE COASTAL AQUIFER NEAR VISAKHAPATNAM, INDIA,
Andhra Univ., Waltair (India). Dept. of Geophysics.
For primary bibliographic entry see Field 5B.
W77-01626

HYDROCHEMISTRY AND GROUND-WATER MIXING IN PART OF THE LINCOLNSHIRE LIMESTONE AQUIFER, ENGLAND,
Birmingham Univ. (England). Dept. of Geological Sciences; and Birmingham Univ. (England). Hydrogeology Section.
For primary bibliographic entry see Field 2F.
W77-01627

HYDROLOGY AND CHEMISTRY OF GROUND WATER IN PUNA, HAWAII,
Colorado School of Mines, Golden. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-01628

DETERMINING THE SOURCE OF NITRATE IN GROUND WATER BY NITROGEN ISOTOPE STUDIES,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 5A.
W77-01636

METHOD FOR PRODUCING MECHANICAL ENERGY FROM GEOTHERMAL BRINE,
Union Oil Co. of California, Brea. (Assignee).
For primary bibliographic entry see Field 3C.
W77-01710

ARTESIAN AQUIFERS,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol. 30, No. 1, p 28-29, November, 1976. 3 fig.

Descriptors: *Aquifers, *Aquifer characteristics, *Groundwater, Potentiometric level, Saline water intrusion, Water wells, *Artesian wells, *Confined water.

Artesian aquifers are aquifers which contain ground water under pressures higher that at normal atmospheric pressure. These aquifers are confined by impermeable beds, usually clay or shale, which limit the ground water to in the aquifer. Inclination of the aquifer increases the hydrostatic pressure of the ground water due to the overlying waters weight exerted on the water the lower part of the aquifer. Water well drilled into the lower part of the aquifer will produce wells with water levels which equal the height of the higher saturated aquifer reservoir, less the pressure drop caused by frictional loss. This principal can be illustrated in physical models. No confining layer is entirely impermeable. Where hydrostatic pressure is low water will migrate slowly through the confining layer toward the low pressured area. This can be a problem where water of objectionable chemical quality migrates into the artesian aquifer. (Heiss-NWWA)
W77-01761

40 GPM. IT WORKS IF YOU HAVE ENOUGH WELLS,
J. Blair.
Irrigation Age, Vol. 11, No 2 p 22, October, 1976. 1 fig.

Descriptors: *Water wells, Irrigation groundwater, Water table, Texas, Loam, *Distribution systems, *Irrigation practices, Irrigation efficiency, Pumping, Plastic pipes, Subsurface irrigation.
Identifiers: *Groundwater depletion.

Irrigation around St. Lawrence, Texas, was started on a hit-or-miss fashion over 20 years ago. With the heavy clay loam soils and 16 inch rainfall, farmers turned to water well irrigation to supplement the erratic rainfall. Water was found between 200 to 250 feet and produced at an average rate of 100 gpm. Because of limited recharge rates and over pumping after a number of years the water yield dropped to 30 or 40 gpm, causing irrigation farmers to use several smaller wells rather than the larger wells of the past. Farmers now drill small holes and use electrical submersible pumps that operate at 5 to 7 1/2 horsepower. A norrow 30 inch deep ditch was then dug for the installation of 4-inch, plastic water distribution pipe. The underground pipe connects two or three small wells and leads to the head of the irrigation block, where 4-inch gated aluminum pipe is used for water outlets. One problem the community will someday face is that of a dropping water table. It is now about 300 feet and drops about 1 foot every year. (Grober-NWWA)
W77-01762

GROUND WATER FLOW IN UNCONSOLIDATED FORMATIONS,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol. 30, No. 10, p 22-23, October, 1976. 4 fig.

Descriptors: *Groundwater, *Recharge, *Drawdown, Water flow, Permeability, Pumping, Water table, Aquifers, Unconsolidated aquifers.
Identifiers: *Cone of depression, Pumping rates, Boundary conditions.

Drawdown is the difference between original static water level and water level during pumping. Drawdown is greatest in the well and decreases in all directions away from the well, forming the cone of depression. Because water in the pumped well is lower than surrounding formations, water moves from the formation into the well. The velocity of water flowing toward the well is a function of the permeability of the porous media. The cone of depression is a function of permeability and hence velocity. Depending on variations in pumping rate, length of pumping period, aquifer characteristics, slope of water table, and amount of recharge available in the vicinity of the well, the shape of each cone of depression will vary. If two wells share an aquifer and their cones of depression intersect, forming a composite cone of depression that is the sum of the individual cones. The shape of the cone of depression will frequently be affected by the boundary conditions encountered as the cone expands. Boundary conditions are changes in the permeability and recharge characteristics of the aquifer produced by faults, changes in rock composition, and interaction of ground water and surface water bodies. As aquifer recharge increases the cone of depression will become less pronounced in that aquifer. (Grober-NWWA)
W77-01763

NEARLY 50,000 NEBRASKA WELLS CAUSING SOME CONCERN.
Irrigation Age, Vol. 11, No. 2, p 20, October, 1976. 1 fig.

Descriptors: *Water wells, *Irrigation, Water table, *Nebraska, Legislation, Regulation, Water law, Withdrawal, Pumping.
Identifiers: *Groundwater depletion, Nebraska Legislative Bill 577.

Nebraska is expected to become the 'most irrigated' state in the nation within the next decade. The number of wells drilled annually in Nebraska has nearly doubled since 1970. As of last year, there were a total of 46,483 wells statewide. Center pivot irrigation has emerged as the predominant method of water application. Along with economic growth, however, has come apprehension over declining water tables and concern for more efficient use of existing water supplies. 'We're getting some reports of groundwater supplies declining consistently from one to three feet annually', says Dr. Les Sheffield, University of Nebraska irrigation development coordinator. One reaction to the problem has been increased emphasis on water conservation, Sheffield reports. Farmers could make substantial water savings through irrigation scheduling programs. Another water-saving measure in effect is Nebraska's Legislative Bill 577, which gives authorization to the state's Natural Resource Districts (NRD's) to declare irrigation control areas. The bill authorizes the NRD's to register wells, increase well spacing, allocate maximum well withdrawals for various crops, order rotation pumping and declare a moratorium on further well drilling for up to one year as a final resort. Proponents of water conservation further suggest that Nebraska must develop additional methods of preserving and utilizing off-season high river and stream flows. Farmers across Nebraska agree that irrigation development has come on far more rapidly that expected but say they prefer local solutions over state or federal controls. (Grober-NWWA)
W77-01765

DRAWDOWN DUE TO PUMPING IN AN ANISOTROPIC AQUIFER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. E. Glover, and W. T. Moody.
Water Resources Bulletin of the American Water Resources Association, Vol. 12, No. 5, p 941-950, October, 1976. 3 ref, append.

Descriptors: *Water wells, *Aquifers, *Drawdown, *Pumping, Permeability, Artesian wells.
Identifiers: *Isotropic aquifers, *Anisotropic aquifers, Cones of depression, Leaky roof anisotropic aquifers.

Formulas for water table or pressure drawdowns due to wells drawing water from isotropic aquifers can be modified for use where the aquifer is nonisotropic. The cases treated are those for a well drawing water from an aquifer at a constant rate, for a well drawing water at a constant rate from an aquifer with a 'leaky roof', and for the flowing artesian well. In all cases the well is considered to completely penetrate the aquifer. The resulting cones of depression formed from pumping an anisotropic aquifer has an oval shape. The length of the major and minor axes of a contour of the cone of depression exhibit the ratio Kx/Ky with Kx the direction of maximum permeability, and Ky in the direction of minimum permeability, which lies at right angles to Kx. (Heiss-NWWA)
W77-01769

RURAL RESIDENTIAL WATER DEMAND: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Univ., Lexington. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6D.
W77-01770

MONITORING GROUND-WATER QUALITY: METHODS AND COSTS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01771

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01772

MONITORING GROUNDWATER QUALITY: DATA MANAGEMENT,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01773

MONITORING GROUNDWATER QUALITY: MONITORING METHODOLOGY,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01775

A MANUAL OF LAWS, REGULATIONS, AND INSTITUTIONS FOR CONTROL OF GROUND WATER POLLUTION,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-01776

MANUAL OF WATER WELL CONSTRUCTIO PRACTICES.
National Water Well Association, Worthingt Ohio.
For primary bibliographic entry see Field 8B.
W77-01777

ALTERNATIVES IN AREA MANAGEMENT GROUNDWATER,
Nebraska Univ., Lincoln. Dept. of Agricultu Economics.
L. K. Fischer.
Nebraska Water Resources Research Institu Lincoln, Completion Report, September 1976. p, 11 ref, 3 append. OWRT B-026-NEB (1), 14-0001-4102.

Descriptors: *Groundwater, Water mana ment(Applied), *Water rights, Water l *Nebraska, *Alternative planning, *Irrigat wells, *Withdrawal, Recharge, Aquifers.

In much of Nebraska irrigation wells are conti ing to be installed rapidly in areas where water bles are already declining. This intensive devel ment is in response to economic incentives an legal system which, in operation, is basically 'law of capture.' Additional incentives are p vided by the 'common pool' nature of resource. Each landholder is induced to develo rigation by the knowledge that the water will withdrawn from beneath his land whether or he makes use of it. Also, many landholders lieve, with considerable justification, withdrawal of water will be restricted in the fut and the right to pump water will be based, at l in part, on the history of use. The results of study indicate that efficient and profitable ir tion on a perpetual basis can be achieve average rates of withdrawal of water from grou water aquifers having a significant rate recharge, are limited to average rates of recha prior to the economic exhaustion of wate storage. The essence of a practical system of w rights seems to involve, on the one hand, rese tion in the public domain of rights to water ne sary to provide for public needs and to protect public interest. The remaining rights should b private hands. Individual action with respect to exercise and transfer of private water ri should be restricted only to the extent necessar protect legitimate public and third-party interes W77-01819

SHALLOW GROUND-WATER SALINIZAT IN DRYLAND FARM AREAS OF MONTANA
Montana Univ., Missoula. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-01822

ANNUAL OPERATION OF A COAST GROUNDWATER BASIN AT A PRESCRI RELIABILITY LEVEL,
Ministry of Agriculture, Jerusalem (Isr Hydrological Service.
Y. Bachmat.
Journal of Hydrology (Amsterdam), Vol. 31, 1/2, September 1976, p 97-118. 4 fig, 5 ref.

Descriptors: *Groundwater basins, *Coastal gineering, *Water management(Appl *Hydrologic aspects, Reliability, Stati models, Operations research, Equations, P ing, Storage, Constraints, Water supply, Aqui Optimization, Sampling, Model studies.
Identifiers: *Annual operation, Seawater i sion, Benefit maximization, Israel, Dyn models, Confidence interval, Natural outflow

Short-term operation of a groundwater bas preferably based on a hydrological operating Such a rule is derived for the gross annual p age from a single-cell coastal groundwater ba a prescribed reliability level of supply. The a pumpage given by the rule consists of a fixed

irrespective of the actual storage, and of a flexible part which is proportional to the prevailing actual storage above sea level. The rule rests upon the physical characteristics of the basin, its groundwater balance, the statistical parameters of a random normally distributed natural replenishment and design variables. The dependence of the parameters of the operating rule on the operational and initial storage, as well as on the parameters of the groundwater system, is analyzed. A procedure for deriving the operating rule is formulated and application of the procedure is illustrated on the coastal groundwater basin in Israel. Possible extensions of the rule are suggested. (Bell-Cornell)
W77-01882

A MODEL STUDY OF THE EFFECTS OF ARTIFICIAL RECHARGE,
Department of the Environment, Reading (England). Central Water Planning Unit.
D. A. Nutbrown.
Journal of Hydrology (Amsterdam), Vol. 31, No. 1/2, p 57-65, September 1976. 5 fig, 3 ref.

Descriptors: *Artificial recharge, *Model studies, *Groundwater, Effects, River regulation, Storage, Flow, Aquifers, Long-term planning, Analytical techniques, Estimating, Systems analysis, Equations.
Identifiers: United Kingdom, Transient analysis.

Some simple analytic and numerical results are obtained which may be used to derive preliminary estimates of the effects of artificial recharge on the storage and flow of groundwater in an unconfined aquifer. In particular, two situations are considered. In the first, a steady-state approach is adopted to describe the long-term effects of recharge and an analytic expression is obtained giving values of the resulting increase in storage. These values compare well with model recharge experiments performed with a detailed description of groundwater flow in the Chalk of the South Downs, U.K. In the second situation, some numerical results are obtained from a transient analysis which describes the seasonal effects of recharge, both on aquifer outflow and storage. These results are relevant to the use of artificial recharge to supplement groundwater storage for river regulation and direct-supply purposes. (Bell-Cornell)
W77-01883

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis.
Hydrological Sciences--Bulletin, Vol. 21, No. 2, p 333-344, June 1976. 29 ref.

Descriptors: *Water resources, *Management, *Groundwater basins, *Water quality control, Optimization, Mathematical models, Aquifers, Waste assimilative capacity, Waste water treatment, Pumping, Recharge, Costs, Water demand, Planning, Equations, Flow, Darcys law, Algorithms, Decision making, Systems analysis.
Identifiers: Cost minimization, Galerkin method, Mass transport.

A mathematical model for the optimal, conjunctive management of a groundwater basin's quality and quantity resources is presented. The quality resource, the assimilative waste capacity, is the ability of the aquifer to degrade certain nonconservative constituents through the actions of molecular diffusion, hydrodynamic dispersion, adsorption, biochemical reactions and convective mass transport. The model is applicable to saturated, isothermal, porous media. The Galerkin method is used to express the spatial and temporal variations in hydraulic head and constituent concentrations as a function of possible recharge, pumping, and treatment decisions. The Galerkin procedure ensures that the constraint equations actually model the response characteristics (flow and mass transport) of the groundwater basin. In each planning period, the groundwater basin is required to meet an exogenous water demand while maintaining adequate water quality levels throughout the aquifer. The model, structured as a mathematical program, minimizes the sum of waste water treatment and pumping and recharge costs. The results indicate (1) the feasibility of conjunctive management of an aquifer's quality and quantity resources, and (2) that the assimilative waste capacity can function as a form of secondary or advanced waste water treatment. (Bell-Cornell)
W77-01884

DIFFERENTIAL-HEAD--LAKE-LEVEL RELATIONSHIPS IN THE MIDDLE-GULF AREA, FLORIDA,
Water and Air Research, Inc., Gainesville, Fla.
H. E. Hudson, Jr.
Ground Water, Vol. 14, No. 5, p 278-282, September-October 1976. 6 fig, 1 tab, 11 ref.

Descriptors: *Groundwater, *Pumping, *Florida, Groundwater movement, Lake bottom springs, Lakes, Wells, Well spacing, Aquifers, Aquifer management, Limestone, Hydrology.
Identifiers: *Lake level, Water levels, Lake behavior, Lake dredging.

Large well-field developments in the Mid-Gulf area of Florida have caused abnormal lowering of nearby lakes. A map showing the differential head between the surficial aquifer and the underlying limestone Floridan aquifer indicated values ranging from 20 feet to zero at a location where the aquiclude is absent. Lake levels had been restored by pumping from limestone wells. From pumping data and analysis of recession limbs, lineal relations between recession rates and differential head appeared to exist. From these, leakance values and vertical permeabilities were determined, with the latter values for two distinctly different sites ranging from 0.02 to 200 gpd/sf. (Lee-ISWS)
W77-01922

EVIDENCE OF SALT-WATER INTRUSION IN SOUTHEASTERN LONG ISLAND,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-01924

DRAWDOWN DUE TO PUMPING IN AN ANISOTROPIC AQUIFER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. E. Glover, and W. T. Moody.
Water Resources Bulletin, Vol. 12, No. 5, p 941-950, October 1976. 3 ref, append.

Descriptors: *Drawdown, *Pumping, *Anisotropy, Aquifers, Equations, Permeability, Water wells, Artesian aquifers, Leakage, Dupuit-Forchheimer theory, Saturated flow, Mathematical studies.
Identifiers: *Cone of depression, Flowing well.

A variable change was used to convert drawdown formulas for isotropic aquifers for use where the aquifer is anisotropic. Contours of the cone of depression assume an oval configuration with the major and minor axes oriented in the directions for which the permeability is greatest and least. The case of a well pumped at a constant rate, the case of a well drawing water at a constant rate from an aquifer with a leaky roof, and the flowing artesian well case were treated. In all cases, the well was considered to completely penetrate the aquifer. (Visocky-ISWS)
W77-01929

SUBSURFACE FLOW INTERCEPTION BY A LOGGING ROAD IN MOUNTAINS OF CENTRAL IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W77-01948

A MODEL FOR CALCULATING EFFECTS OF LIQUID WASTE DISPOSAL IN DEEP SALINE AQUIFERS, PART I--DEVELOPMENT.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W77-02010

BIBLIOGRAPHY AND SELECTED ABSTRACTS OF REPORTS ON WATER RESOURCES AND RELATED SUBJECTS FOR ARKANSAS THROUGH 1975,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 10C.
W77-02014

A DRAWDOWN PREDICTION MODEL BASED ON REGRESSION ANALYSIS,
Geological Survey, Reston, Va.
T. Maddock,III.
Water Resources Research, Vol 12, No 4, p 818-822, August 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Drawdown, *Water wells, *Groundwater, *Model studies, *Regression analysis, Forecasting, Methodology, Equations, Pumping, Water yield, Water levels, Well spacing.

A technique for determing algebraic technological functions (ATF) relating the drawdown at wells to the quantity of water withdrawn from those wells is developed. The inputs are the time series of historical pumping and water levels, the distances between wells, the radius of the well, and the duration of a pumping period. A stepwise regression analysis is then used to determine the coefficients of the ATF. The functional form of the regression equation is based on standard results from groundwater analysis. (Woodard-USGS)
W77-02015

EFFECT OF HIGH-PRESSURE DEFORMATION ON PERMEABILITY OF OTTAWA SAND,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W77-02021

GROUND-WATER RECORDS FOR SOUTHEASTERN OKLAHOMA: PART 1--RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 7C.
W77-02024

WATER RESOURCES OF THE LITTLE FORK RIVER WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02033

4C. Effects On Water Of Man's Non-Water Activities

SNOW-ROAD CONSTRUCTION--A SUMMARY OF TECHNOLOGY FROM PAST TO PRESENT,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
J. L. Barthelemy.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-021 868, Price codes: A03 in paper copy, A01 in microfiche. Report TR-831, December 1975. 37 p, 10 fig, 28 ref, append.

Descriptors: *Cold weather construction, *Road construction, *Snow, *Antarctic, Construction materials, Equipment, Compaction, Construction equipment, History, Cold regions, Polar regions, Strength of materials, Civil engineering, Reviews.
Identifiers: *Compacted-snow pavements, Hardening, Depth-processing, Densification, Layer-compaction.

During 1947, Naval Construction Forces built a compacted-snow airstrip on the Ross Ice Shelf in Antarctica. Research methods since then have improved the use of snow as a construction material. Snow-compaction techniques and equipment initially developed by the Civil Engineering Laboratory (CEL) for runway construction have been used to build durable, high-strength roads. At the present time, properly constructed and routinely maintained roads built from specially processed snow can support passenger vehicles, pickups, vans, trucks, and tractor-trailer combinations fitted with flotation tires at gross weights up to 75,000 pounds. Two methods of construction developed by CEL were recommended in this report: (1) layered-compaction, and (2) depth-processing. In layered-compaction, the most recently perfected technique, a snow pavement is elevated to a desired height by compacting successive 4-inch layers using a rotary snowplow to gather, process, and deposit the snow material. The alternative method requires depth-processing, using snow mixers to pulverize material placed on the roadway. This final report documented the evolution of vehicle road systems on snow and presented a synoptic overview summarizing all aspects of snow-road technology from theoretical considerations to historical development and recommended procedures. (Sims-ISWS)
W77-01638

EVALUATION OF THE USE OF SALT BRINE FOR DEICING PURPOSES,
Connecticut Dept. of Transportation, Rocky Hill, Materials Testing Lab.
M. M. Kasinskas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 918, Price codes: A02 in paper copy, A01 in microfiche. Report HPR-PR-PL-1(12), April 1975. 16 p, 10 fig, 1 ref.

Descriptors: *Deicers, *Brines, *Highways, *Snow removal, Laboratory tests, Sodium chloride, Salts, Snowpacks, Highway icing, Roads, Jets, Nozzles, Orifices, Equipment, Economics, Maintenance, Maintenance costs.
Identifiers: Snow plowing, Chemical deicing.

The formation of dense snowpack and ice on high volume roadways is of major concern during snow removal operations. The use of conventional snowplow blades, which normally lack the ability to deeply penetrate a snow cover of this type, results in the excessive use of chlorides, equipment, and time. This report covered both current problems encountered during snow removal operations and a new concept for the removal of a dense snowpack and ice from a pavement surface. The concept proposed using a NaCl brine solution under high velocity jet stream conditions to penetrate a snowpack. It was found that the abrasive qualities of a turbulent boundary layer around a jet stream and the drag produced by the pack in changing the momentum of the brine stream destroy or loosen the pack sufficiently to enable economical and effective plowing. (Sims-ISWS)
W77-01639

WATER YIELDS RESULTING FROM TREATMENTS ON THE WORKMAN CREEK EXPERIMENTAL WATERSHEDS IN CENTRAL ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Temple, Ariz.
L. R. Rich, and G. J. Gottfried.
Water Resources Research, Vol. 12, No. 5, p 1053-1060, October, 1976. 8 fig, 12 ref, 2 tab.

Descriptors: *Water yield improvement, *Watershed management, *Arizona, Water supply, Water yield, Hydrology, Streamflow, Sedimentation, *Forest watersheds, Burning, Lumbering, Grasses waterways, Pine trees, Surface runoff, Ponderosa pinetrees, Instrumentation, Coniferous forests.
Identifiers: *Workman Creek Watershed(Ariz).

The three Workman Creek watersheds were instrumented to determine the hydrology of mixed conifer forests and to determine the changes in streamflow and sedimentation as a result of manipulating the forest vegetation. A small riparian cut on North Fork did not increase water yield. A selection timber harvest, improvement cut, and fire which removed 45% of the basal area on South Fork increased water yields slightly. In contrast, converting 32.4 ha (80 acres) of moist forest site to grass significantly increased water yields on the 100.4-ha (248 acre) North Fork watershed. Water yields were increased even more after 40.5 ha (100 acres) of dry-site pine forest were converted to grass. An increase of 69 mm (2.70 inches), or 84%, of expected runoff resulted from the combined treatment. Clearing 83% of the South Fork watershed preparatory to planting ponderosa pine significantly increased water yields by 93 mm (3.67 inches), or by 111%. (Witt-IPC)
W77-01660

THE EFFECT OF PARK USE ON SURFACE WATER QUALITY,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 5C.
W77-01692

PROJECT PROPOSAL FOR SURFACE-MINED LAND ENHANCEMENT (SMILE),
Federal Energy Administration, Washington, D.C. Office of Coal.
For primary bibliographic entry see Field 5G.
W77-01699

EFFECTS OF URANIUM MINING AND MILLING ON GROUND WATER IN THE GRANTS MINERAL BELT, NEW MEXICO,
Office of Radiation Programs, Las Vegas, Nev.
For primary bibliographic entry see Field 5C.
W77-01923

DISASTERS CAUSED BY FLASH FLOODS,
National Research Center for Disaster Prevention, Tokyo (Japan).
For primary bibliographic entry see Field 2E.
W77-01937

SOME CONSEQUENCES OF AREA WIDE RUNOFF CONTROL STRATEGIES IN URBAN WATERSHEDS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-01947

SUBSURFACE FLOW INTERCEPTION BY A LOGGING ROAD IN MOUNTAINS OF CENTRAL IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
W. F. Megahan.
In: National Symposium on Watersheds in Transition, 1972, p. 350-356. 5 fig., 3 tab., 8 ref.

Descriptors: *Subsurface flow, Roads, *Idaho, Slopes, Snowmelt, Erosion, Overland flow, Runoff, Hydraulic conductivity, Soils, Bedrock, Groundwater, *Interception, *Lumbering, Weathering, Granites.
Identifiers: *Idaho Batholith, Mass erosion, Roadents.

Conditions on mountain slopes in the Idaho Batholith are particularly conducive to the formation of subsurface flow. Roads in the area often increase flow levels, thereby transforming subsurface flows into surface flow. A study was designed to measure the amount of subsurface flow intercepted by a road on two representative microwatersheds in the area. Instrumentation included a climatic station; snow lysimeters; a network of snow stakes, soil moisture-access tubes and piezometers; and apparatus to measure surface and subsurface flows. No surface flows occurred at any time. Subsurface flows were restricted to the spring snowmelt periods of 1970 and 1971. Maximum flows occurred during 1971; the volume for that year totaled 8.4 inches per unit area of watershed above the road. Flows varied slightly between watersheds, but were vastly different between years. Yearly differences were related to amounts and to rates of inflow. A comparison of flows from nearby perennial watersheds suggests that the weathered granitic bedrock is more hydrologically active than was previously thought. The amount of subsurface flow intercepted by roads is compared to the flow generated by overland flow for the area disturbed by road construction and the potential for damages is discussed. (Forest Service)
W77-01948

SIMULATION OF FOREST CHANGES RELATED TO HYDROLOGIC VARIABLES IN THE ATCHAFALAYA RIVER BASIN, LOUISIANA,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W77-02019

4D. Watershed Protection

LABORATORY TESTING OF WATER-REPELLENT SOIL TREATMENTS FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. H. Fink.
Soil Science Society of America Journal, Vol. 40, No. 4, p 562-566, July-August 1976. 3 fig, 2 tab, 1 ref.

Descriptors: *Repellents, *Water harvesting, *Laboratory tests, *Soil treatment, Watersheds(Basins), Soils, Water conservation, Arid lands, Erosion, Weathering, Stabilization, Soil stabilization, Soil science.
Identifiers: *Water repellants, Water repellant soil treatment.

Field testing of repellents for water harvesting is both slow and costly, often hindering the orderly rapid progression of the technique. Laboratory tests were developed for rapidly evaluating the effectiveness of water-repellent treatments on soil. The effect of accelerated weathering from ultraviolet radiation, ozone, and freeze-thaw cycling on the retention of water repellency and on soil stability was studied. The effect on soil stability of prolonged hydration and water erosion was also considered. Using these laboratory tests, numerous soils, organic materials, and treatment techniques can be quickly evaluated so that field testing can be reserved for only the most promising. A small, representative laboratory study, reported here to illustrate the technique, showed that two repellents (a petroleum resin dust-suppressant oil and paraffin wax) when combined made soil generally more resistant to to

weathering effects than did either repellent alone. The dust suppressant helped to stabilze the soil against damage by freeze-thaw cycling, while the wax protected it from degradation by ultraviolet radiation. These laboratory results compared favorably with observations from field plots treated with these two repellents. (Sims-ISWS)
W77-01621

WATER YIELDS RESULTING FROM TREATMENTS ON THE WORKMAN CREEK EXPERIMENTAL WATERSHEDS IN CENTRAL ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Temple, Ariz.
For primary bibliographic entry see Field 4C.
W77-01660

IMPACT OF WATER RESOURCE DEVELOPMENT ON COASTAL EROSION, BRAZOS RIVER, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-01681

A STOCHASTIC SEDIMENT YIELD MODEL FOR BAYESIAN DECISION ANALYSIS APPLIED TO MULTIPURPOSE RESERVOIR DESIGN,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
J. H. Smith.
Master of Science Thesis, 1975. 45 p, 7 fig, 1 tab, 24 ref.

Descriptors: *Stochastic processes, *Sediment yield, *Watershed management, *Reservoir design, Analytical techniques, Mathematical models, Statistical models, Reservoir storage, Linear programming, Dams, Sediments, Water control, Rainfall, Rainfall intensity, Storms, Runoff, Precipitation(Atmospheric), Water storage, Semiarid climates.
Identifiers: *Bayesian decision analysis.

A methodology is presented for obtaining the optimal design capacity for sediment yield in multipurpose reservoir design. A stochastic model is used for prediction of sediment yield in a semi-arid watershed based on rainfall data and watershed characteristics. Uncertainty stems from the random variables used in the model: rainfall amount, storm duration, runoff, peak-flow rate, and number of events per season. Using the stochastic sediment yield model for N- seasons, a Bayesian decision analysis is carried out for a dam site in southern Arizona. Extensive numerical analysis and simplifying assumptions are made to facilitate finding the optimal solution. The model has applications in the planning of reservoirs and dams where the effective lifetime of the facility may be evaluated in terms of storage capacity and of the effects of land management on the watershed. Experimental data from a watershed are used to calibrate the model and evaluate the uncertainities of rainfall distribution and storm duration parameters used in calculating the sediment yield amount. (Jamail-Arizona)
W77-01892

DUST STORMS,
For primary bibliographic entry see Field 2B.
W77-01895

AGRICULTURAL WATER POLLUTION: SOME PROBLEMS ASSOCIATED WITH ITS CONTROL,
Kansas Univ., Lawrence. Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-01898

RAINFALL EROSIVITY OVER RHODESIA.
Rhodesia Univ., Salisbury. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-01901

FIELD MONITORING EQUIPMENT FOR HYDROLOGICAL STUDIES IN A SMALL CATCHMENT,
Bristol Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W77-01936

SOME CONSEQUENCES OF AREA WIDE RUNOFF CONTROL STRATEGIES IN URBAN WATERSHEDS,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. A. Hardt, and S. J. Burges.
Charles W. Harris Hydraulic Laboratory, Technical Report 48, June 1976. 81 p., 4 tab., 2 ref., 14 fig. OWRT A-078-WASH(1), 14-31-0001-6050.

Descriptors: *Urban runoff, Rainfall-runoff relationships, Design, Streamflow routing, Runoff, Peak discharge, Water management(Applied), *Water control, Flow control, Urbanization.
Identifiers: Flood mitigation, *Urban watersheds, *Runoff control.

Consequences of 'blanket' runoff control management strategies that require all future developments in urban and suburban areas to maintain peak flow rates from their sites at the level that existed prior to urbanization were examined. Hypothetical watersheds were studied to determine some bounds to the overall runoff management issue. Principal findings indicated that: (1) Runoff control strategies must be evaluated at the entire watershed level, not on local jurisdictional boundaries. (2) Without detailed sub-basin discharge hydrographs and main channel characteristics, the optimum drainage management scheme cannot be established. (3) Runoff volume reduction appears to be one means of achieving more effective runoff control. (4) Restricting the outflow from a retention facility to a level less than the undeveloped rate could achieve a composite peak flow rate that would equal the pre-urbanization flow but would run for a much greater duration at that rate. (5) Longer duration storms falling on the sub-basins under consideration produced higher peaked watershed outflow hydrographs than did shorter, more intense rainfalls. (6) For storm magnitudes greater than the control system design storm, two possibilities exist: a higher peak rate or an equal peak rate to that which would have occurred without control. Mixed control strategies were shown to be useful in some circumstances. Generally, each drainage basin must be examined to determine what management options will work. Blanket policies were shown to be unwise in many situations; administrative convenience is not a panacea for managing urban runoff.
W77-01947

SOUTHEASTERN FORESTS AND THE PROBLEM OF NON-POINT SOURCES OF WATER POLLUTION,
Forest Service (USDA), Franklin, N. C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W77-01952

WATER RESOURCES OF THE RAINY LAKE WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02032

WATER RESOURCES OF THE LITTLE FORK RIVER WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02033

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF ADSORBED WATER PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
V. V. Inanov.
Biofizika 20(3), p 394-397, 1975.

Descriptors: *Water properties, *Water structure, *Molecular structure, Adsorption, Biological properties, Physiochemical properties.
Identifiers: *Nuclear spin relaxation, *Water protons.

The theoretical calculation of the nuclear spin relaxation times T1 and T2 of water protons adsorbed on biological matrices is considered for the case of relaxation diffusive mechanism. The influence of the molecular elementary jump realization number and long-range order of the spin interaction on values T1 and T2 is shown.--Copyright 1976, Biological Abstracts, Inc.
W77-01563

SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF WATER ADSORBATE PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
N. V. Ratinikova, V. V. Ivanov, and Yu. N. Moskvich.
Biofizika 20(3), p 398-402, 1975.

Descriptors: *Water properties, *Water structure, *Molecular structure, Adsorption, Biological properties, Physicochemical properties, Rodents.
Identifiers: Albumin, Biological matrices, *Nuclear spin relaxation.

The structure and mobility of water molecules adsorbed on rat collagen and ovalbumin were investigated by the spin-echo method. The differentiation of adsorbate to 2 subsystems, 1 of which is the hydrate shell of the macromolecules, was found. The molecular exchange between subsystems takes place with temperature-dependent intensities.--Copyright 1976, Biological Abstracts, Inc.
W77-01564

CONCENTRATION OF VIRUSES IN WATER BY THE POLYMER TWO PHASE SYSTEM: QUANTITATIVE STUDY, (IN FRENCH),
Nancy-1 Univ. (France). Unite de d'Enseignement et de Recherche des Sciences Pharmaceutiques.
L. Schwartzbrod, J. C. Block, P. Dixneuf, J. Schwartzbrod, and J. C. Brochet.
C R Seances Soc Biol Fil, 169(3), p 641-644, 1975.

Descriptors: *Viruses, *Pollutant identification, Analytical techniques.
Identifiers: Picornavirus, *Polymer two phase systems, Poliomyelitis.

The sensitivity of the polymer 2 phase system with varying concentrations of viruses in water was studied. This technique agrees with research on poliomyelitis viruses in water; viral recovery is always >74.5%. Average percentages of recovered viruses are always 100% where the initial virus concentrations are 102 or 103/1; if the initial concentration is higher the yield of this method decreases.

W77-01567

CHROMIUM AND MERCURY IN A SOIL AFTER 80 YEARS OF TREATMENT WITH URBAN SEWAGE WATER, (IN GERMAN),
For primary bibliographic entry see Field 2K.
W77-01568

SUBMERSED MACROPHYTES AND THEIR COMMUNITIES AS INDICATORS OF WATER CONTAMINATION,
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany).
For primary bibliographic entry see Field 5C.
W77-01570

HYDROCARBON DETERMINATION IN WASTE WATERS BY MEANS OF CHANNEL THIN LAYER CHROMATOGRAPHY, (IN ITALIAN),
Rome Univ. (Italy). Istituto di Chimica Analitica.
G. Goretti, A. Liberti, and B. M. Petronio.
Ann Chim 64(9/10), p 653-658, 1974.

Descriptors: *Pollutant identification, *Chromatography, *Organic compounds, Analytical techniques.
Identifiers: Thin layer chromatography.

Channel TLC may be used for the direct determination of hydrocarbons in waste water. By using silica gel TCL plates and a chloroform/benzene mixture(1:3)hydrocarbons are separated from fats and other organic compounds extractable in ether. From the length of the brown spot appearing after exposure to I vapors the hydrocarbon content is determined. By using a 0.2 ml sample the direct determination of hydrocarbon quantities up to 5 mg/l is carried out. Various analytical possibilities are discussed.
W77-01573

USE OF GAS CHROMOTOGRAPHY FOR STUDYING THE ACCUMULATION OF ORGANOCHLORINE PESTICIDES IN WATER AQUATIC ORGANISMS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
D. B. Girenko, M. A. Klisenko, and Yu. K. Pishcholka.
Gidrobiol Zh 11(3), p 69-72, 1975.

Descriptors: *Gas chromatography, *Pollutant identification, *Pesticide residues, *DDT, Fish, Crayfish, Perch, Pike, Organic pesticides, *Chlorinated hydrocarbon pesticides, Insecticides.
Identifiers: Anodonta, Bream, *Lindane, *Organochlorine pesticides, *Methoxychlor.

The gas chromatographic method proposed for studying the accumulation of chlorinated hydrocarbon pesticides (DDT, lindane, methoxychlor, etc.) in natural waters and aquatic organisms, particularly fish, is based on extraction of the sample with organic solvents, purification of the extract and determination of the pesticide on a chromatograph with an electron capture detector. The use of this sufficiently sensitive and selective gas chromatographic method of analyzing pesticide residues permits accomplishing, monitoring of the content of pesticide residues in water and aquatic organisms. (Anodonta, crayfish, pike-perch, pike and bream were included in the study.)--Copyright 1976, Biological Abstracts, Inc.
W77-01574

DETERMINATION OF ESTIMATED MAXIMUM PERMISSIBLE AND MAXIMUM RESIDUAL CONCENTRATIONS OF PESTICIDES IN ENVIRONMENTAL OBJECTS, BASED ON THE PRINCIPLES OF COMPLEX (INTEGRAL) STANDARDIZATION, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5G.
W77-01575

METHOD OF DETERMINING THE TOTAL BIOCHEMICAL OXYGEN DEMAND OF SEWAGE WITH THE USE OF VARIOUS NITRIFICATION INHIBITORS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhincheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Moscow (USSR).
Y. Lur'e, and V. A. Odaryuk.
Gig Sanit 5, p 66-70, 1975.

Descriptors: *Biochemical oxygen demand, Sewage, Nitrification, Inhibition, *Nitrifying bacteria, Methodology, *Pollutant identification, Ureas.
Identifiers: *Thioureas.

The total biochemical O2 demand (BOD) of sewage and solutions of chemically pure substances can be determined with the nitrification inhibitors allylthiourea, thiourea and ethylene thiourea. These chemicals in a concentration of 0.5 mg/l inhibited nitrifying bacteria but did saprophytic microflora. Ethylene thiourea inhibited nitrification in all experiments until the end of the determinations (52 days) and is recommended for determining the total BOD of all sewage, especially when difficult to oxidize. The action period of allylthiourea and thiourea averaged 8-10 days; they are usable for readily oxidizable sewage. The method is simple and eliminates determination of ammonia, nitrites and nitrates.--Copyright 1976, Biological Abstracts, Inc.
W77-01579

PRACTICAL USE OF POLAROGRAPH MODELS PPT-1 AND OP-5122, (IN RUSSIAN),
M. G. Gavrilina, E. D. Dukhovnaya, E. N. Grekova, and M. F. Salikhdzhanova.
Gig Tr Prof Zabol 6, p 52-53, 1975.

Descriptors: *Lead, *Pollutant identification, *Polarographic analysis, Analytical techniques, Water pollution.

Oscillographic (OP-5122) and alternating-current (PP-1) polarographs with their high resolution can be used to determine Pb quickly and simply in metallurgical products, in biological media and in wastewaters from the microgram concentrations to whole fractions of a percent.
W77-01588

ISOLATED STRAINS OF ESCHERICHIA COLI FROM THE WATER SUPPLY AND RESIDUAL WATERS OF LARGE HOG FARMS, (IN FRENCH),
Institutul Agronomic din Timisoara (Rumania). Dept. of Nutrition and Animal Hygiene.
M. Decun, V. Tomescu, and E. Crainiceanu.
Institutul Agronomic din Timisoara). Dept. of Nutrition and Animal Hygiene.

Descriptors: *E. coli, Water supply, *Farm wastes, Water sampling, Treatment facilities, Isolation, Bacteria, Bacteriology, Epidemiology, *Pollutant identification, Hogs.
Identifiers: Eipzootiology.

By bacteriological examination of 121 water samples from wells, water supply installations and sewage purification plants, 523 strains of E.coli were isolated. Their biochemical and serological typing revealed 66 cultures belonging to 28 serogroups some of which are potentially pathogenic for animals and man. The study of hemolytic and enterotoxic properties, their viability and variability in water, their resistance to antibiotics and chemotherapeutics and the evalustion of their epidemiologic and epizootologic implications suggest a causative chain: animal-water-man
W77-01589

ASSESSMENT OF CADMIUM IN FISHES FROM CARINTHIAN LAKES, (IN GERMAN),
M. Weiser, A. Lottermoser, H. Weingarten, and W. E. Krocza.
Wien Tieraerztl Monatsschr 62(6-8), p 214-217, 1975.

Descriptors: *Cadmium, Absorption, Fish, Lakes, *Flame photometry, Pike, Perch, Carp, Pollutant identification, Brook trout.
Identifiers: *Carinthian Lakes.

Cd concentrations were assessed in the back muscles of fish from Carinthian lakes using atomic absorption flame photometry. Thirteen species (9 specimens) were used in the study: pike, chub, perch, rudd, roach, undermouth, tench, barbel, bream, brook trout, white bream, Bavarian roach and carp. The arithmetic mean Cd concentration within the total population was about 39 ppb. C intake by consumption of fish from the Carinthia lakes covered by this study is far below the tempo rary acceptable weekly intake of 400-500 ug C established by the WHO.--Copyright 1976, Biolog ical Abstracts, Inc.
W77-01593

PHOTOMETRIC DETERMINATION O ISOPRENE AND NEOZONE D IN WATER, (I RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow Institut Biofiziki.
Z. A. Krotova.
Gig Sanit 4, p 61-63, 1975.

Descriptors: *Pollutant identificatio *Photometry, *Organic compounds, Analytica techniques.
Identifiers: *Isoprene, *Neozone D.

A photometric method of determining isopren and the rubber antioxidant Neozone D in wate based on their interaction with diazotized solutio of p-nitroaniline, was developed. By this method is possible to analyze waters containing isopren at the maximum permissible level for water bodie (0.005 mg/1) and Neozone D in aconcentration o 0.004 mg/1. The relative error of determinin isoprene is 12% and Neozone D 20%.
W77-01594

METEOROLOGICAL FACTORS AND AIR POL LUTION IN SOFIA, (IN RUSSIAN),
Academy of Medicine, Sofia (Bulgaria). Center fo Hygiene.
I. Kalpazanov, and G. Kurchatova.
Gig Sanit 5, p 83-84, 1975.

Descriptors: *Meteorology, *Air pollutio Regression analysis, *Oxides, *Sulfides, Europe Nitrogen.
Identifiers: *Sofia(Bulgaria).

The results of daily chemical determinations of th air in Sofia, Bulgaria, were compared with a mospheric pressure, cloud cover, visibility, a temperature, relative humidity and wind spee Multiple correlation coefficients were determine by regression equations. Meteorological facto play a role in pollution by removal of nitrogen o ides, oxidants, formaldehyde and hydrogen sulfi in the air of Sofia.
W77-01601

SIGNIFICANCE OF SUSPENDED LOAD AN BOTTOM DEPOSITS IN SELF-PURIFICATIO OF THE SELENGA RIVER FROM PETROLE UM PRODUCTS, (IN RUSSIAN),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 5G.

W77-01606

THIN-LAYER CHROMATOGRAPHIC TECHNIQUE FOR IDENTIFICATION OF WATERBORNE PETROLEUM OILS,
Coast Guard Research and Development Center, Groton, Conn.
V. A. Saner, and G. E. Fitzgerald, II.
Environmental Science and Technology, Vol. 10, No. 9, p 893-897, September 1976. 6 fig, 4 tab, 7 ref.

Descriptors: *Pollutant identification, *Oil spills, Oil pollution, *Chemical analysis, *Analytical techniques, *Chromatography, Chemistry, Water pollution sources, Instrumentation, Fuels, Gasoline, Oil wastes, Organic matter, Water pollution, Fluorescence, Evaluation, Aromatic compounds, Methodology.
Identifiers: *Waterborne petroleum oils, *Thin-layer chromatographic technique, Polar compounds, Iodine staining, Diesel fuels, Ship bilge oil, Kerosine.

A thin-layer chromatographic procedure for the identification of water-borne petroleum oil pollutants for use in either the laboratory or the field was developed. Aromatic and polar compounds were removed from the oil sample by a liquid-liquid extraction with acidified methanol. The extract was then chromatographed on a silica-gel, thin-layer plate. Separated components were detected by their fluorescence under long and short wave ultraviolet light. Iodine staining was also used to visualize unsaturated, nonfluorescing compounds. The procedure was successfully applied to 'fingerprinting' gasolines, kerosines, diesel oils, heavy fuel oils, lubricating oils, and ship bilge oils. (Henley-ISWS)
W77-01631

PETROLEUM ANALYSIS: METHODOLOGY FOR QUANTITATIVE AND QUALITATIVE ASSESSMENT OF OIL SPILL,
National Bureau of Standards, Washington D.C. Inorganic Standards Section; and National Bureau of Standards, Washington D.C. Trace Organic Analysis Group; and National Bureau of Standards, Washington Chemistry Div.
J. S. Hertz, W. E. May, S. N. Chesler, and B. H. Thump.
Environmental Science and Technology, Vol. 10, No. 9, p 900-903, September 1976. 3 fig, 2 tab, 5 ref.

Descriptors: *Pollutant identification, Oil, *Oil spills, *Oil pollution, *Chemical analysis, Analytical techniques, *Water pollution sources, Oil wastes, Gas chromatography, Mass spectrometry, Chemistry, Instrumentation, Fuels, Organic matter, Chromatography, Marine biology, Marine animals, Equations, *Methodology.
Identifiers: *Oil analysis, Marine environment, Chromatographic methods, Organic extractions, Headspace technique, Marine organisms, Dynamic headspace sampling, Oil spill assessment, Oil-water emulsion, Petroleum compounds.

An integrated chromatographic technique for petroleum analysis compatible with long-term studies of oil spills was presented. Dynamic headspace sampling and the complementary analytical techniques of gas chromatography and coupled-column liquid chromatography were utilized for quantitation of petroleum-containing samples. Gas chromatography-mass spectrometry was employed for identification of individual components in these samples. Analytical data obtained from a major oil spill were presented and discussed. (Henley-ISWS)
W77-01632

DETERMINING THE SOURCE OF NITRATE IN GROUND WATER BY NITROGEN ISOTOPE STUDIES,
Texas Univ. at Austin. Bureau of Economic Geology.
C. W. Kreitler.
Report of Investigations No. 83, 1975. 62 p, 25 fig, 23 tab, 109 ref, 6 append.

Descriptors: *Pollutant identification, *New York, *Texas, *Missouri, *Nitrates, *Isotope studies, *Nitrogen compounds, *Groundwater, *Nitrogen cycle, Analytical techniques, Inorganic compounds, Chemical wastes, Fertilizers, Leaching, Nitrites, Water pollution sources, Ammonia, Ureas, Chemicals, Nitrification.
Identifiers: *Nitrogen isotope studies, Isotopic ratios, *Groundwater nitrate studies, *Runnels County(Tex), Specific ion electrode, Nitrate ions, Ammonium ions, Chemical fertilizers, Barnyard wastes.

Because of potential health problems, the extent of nitrate contamination and the major nitrate contributors to a water supply should be known. Nitrate concentrations above 1 or 2 mg/l are in the groundwaters in many of the geographic areas of Texas with the highest percentage values in West-Central and North-Central Texas. The highest average nitrate concentration in Texas was found in Runnels County. Analysis revealed the following conditions: There are two isotopic ranges of soil nitrate in the soils of southern Runnels County. Nitrate from the decomposition of animal waste nitrogen has a del N15 (delta N15) of +10 ppt to +22 ppt. The isotopic ratio is controlled by the volatilization of isotopically light ammonia gas during the decomposition of urea in urine. Nitrate derived from the mineralization of organic nitrogen in cultivated soils has a del N15 of +2 ppt to +8 ppt. In southern Runnels County, the major source of nitrate in groundwater is natural soil nitrate. The isotopic composition of groundwater nitrate beneath cultivated fields corresponds with del N15 of natural soil nitrate. Groundwaters beneath farmhouse-barnyard complexes have a higher average del N15, indicating the addition of animal waste nitrate. Eleven samples of groundwater from Macon County, Missouri, have del N15 of +10 ppt to +19 ppt, indicating that the waters are contaminated with nitrate from animal wastes. Nitrates in groundwaters from the Upper Glacial aquifer in Queens County, New York, appear to be from an animal waste source, whereas nitrates in groundwaters from the Magothy aquifer in Nassau County, New York, appear to be from either natural soil nitrogen or artificial fertilizer. (Henley-ISWS)
W77-01636

PERFORMANCE CHARACTERISTICS FOR THE SPECTROPHOTOMETRIC DETERMINATION OF TOTAL IRON IN FRESHWATER USING HYDROCHLORIC ACID,
Freshwater Biological Association, Windermere (England).
W. Davison, and E. Rigg.
The Analyst, Vol. 101, No. 1205, p 634-638, August, 1976. 12 ref, 2 tab.

Descriptors: Freshwater, *Water analysis, *Iron, *Pollutant identification, *Spectrophotometry, *Analytical techniques, Copper, Water pollution sources, Metals, Iron compounds, Water, Trace elements, Water chemistry, Water properties, Heavy metals.

A method is described for the determination of total Fe in freshwater, using a wet-oxidation procedure followed by spectrophotometric measurement in 5.93 + or - 0.07 M HCl. It has been used successfully in routine analyses for several years and requires only standard equipment and inexpensive reagents. The limit of detection is 0.009 mg/liter for the 95% confidence level. The relative standard deviation at 0.2 mg/liter is 4.4% and at 3 mg/liter is 1.5% for 19 degrees of freedom. Comprehensive interference tests show that the method is adequately selective for use with freshwater. Copper is the only substance to interfere significantly, but below 0.1 mg/liter it has a negligible effect. (Witt-IPC)
W77-01642

AN AUTOMATED METHOD FOR THE DETERMINATION OF LOW-LEVEL KJELDAHL NITROGEN IN WATER AND WASTE WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
O. Elkei.
Analytica Chimica Acta, Vol. 86, p 63-68, October, 1976. 2 fig, 10 ref, 2 tab.

Descriptors: *Pollutant identification, *Water analysis, *Nitrogen compounds, *Colorimetry, Analytical techniques, Ammonia, Digestion, Water pollution sources, Water properties, Trace elements, Automation, Chemical analysis.

An automated system for low-level Kjeldahl nitrogen determinations in water samples is described. Samples are continuously digested at 300 C with sulfuric acid and hydrogen peroxide to convert the organic nitrogen to ammonia, which is determined colorimetrically with sodium salicylate and sodium dichloroisocyanurate (as chlorine source). The method has a range of 10-500 micrograms N/liter with good precision and accuracy. (Witt-IPC)
W77-01643

INVESTIGATION OF THE PROBLEM OF DETERMINING TOTAL SUSPENDED SOLIDS IN PULP AND PAPER EFFLUENTS,
ITT Rayonier Inc., Shelton, Wash.
D. R. Kendall.
Tappi, Vol. 59, No. 9, p 75-78, September, 1976. 4 tab.

Descriptors: *Suspended solids, *Pulp wastes, *Centrifugation, *Filtration, Wastes, Industrial wastes, Water pollution sources, Turbidity, Filters, Analytical techniques, Effluents, Analysis, Pollutant identification.

Five techniques of determining total suspended solids in pulp and paper mill effluent were investigated for the purpose of finding a method which would (1) include turbidity-producing, finely divided, biological solids; (2) be practical for use as routine monitoring tool; and (3) form the basis for obtaining data to generate effluent guidelines that relate to the Environmental Protection Agency definition of total suspended solids. A technique utilizing centrifugation followed by filtration of the entire sample through a 2.4-cm diameter fiber glass disk situated in a porous-bottom crubicle has produced the most promising results. This technique gave results which were consistent and independent of sample volume, inclusive of turbidity-producing solids, and obtainable within a reasonable analysis time. The technique is capable of handling problem effluents containing difficult-to-filter, amorphous biological solids. (Sykes-IPC)
W77-01652

ANNUAL BOOK OF ASTM STANDARDS. PART 31: WATER,
American Society for Testing and Materials, Philadelphia, Pa. 1976. 956 p.

Descriptors: *Water analysis, *Standards, *Analytical techniques, *Specifications, *Testing procedures, Sampling, Flow measurement, Physical properties, Hydrogen ion concentration, Conductivity, Corrosion, Odor, Hardness(Water), Specific gravity, Surface tension, Turbidity, Suspended solids, Toxicity, Inorganic compounds, Organic compounds, Heavy metals, Dissolved oxygen, Phosphorus, Silica, Phenols, Radioactivity, Radioisotopes, Bacteria, Bioassay,

Water treatment, *Pollutant identification, *Water quality standards.

The standards included in this volume are those developed by ASTM Committee D-19 on definitions, specifications, reagents, and test procedures pertaining to water; sampling and flow measurements; general (physical) properties of water (pH, conductivity, corrosivity, odor, hardness, specific gravity, surface tension, turbidity, particulates, toxicity); analysis for inorganic and organic constituents (heavy metals, dissolved oxygen, phosphorus, silica, phenolic compounds, etc.); radioactivity (radionuclides, heavy water); bacteriological bioassay; water-formed deposits; and water-treatment materials, such as ion-exchangers. (Brown-IPC)
W77-01662

PHENOLIC AND CHLOROPHENOLIC OLIGOMERS IN CHLORINATED PINE KRAFT PULP AND IN BLEACH PLANT EFFLUENTS,
State Univ. of New York at Syracuse. Empire State Paper Research Inst.
For primary bibliographic entry see Field 5B.
W77-01669

A STUDY TO DEFINE CHANGES IN PULP MILL EFFLUENT-CONTRIBUTED COLOR IN RECEIVING WATERS DETECTABLE BY HUMAN OBSERVERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. C. Whittemore, and J. J. McKeown.
NCASI Stream Improvement Technical Bulletin, No. 283, 160 p, December, 1975. 18 fig, 125 ref, 100 tab.

Descriptors: *Pulp wastes, Natural streams, *Color, Colorimetry, Effluents, Water pollution sources, Wastes, Industrial wastes, *Water pollution, Water pollution effects, Water properties, Water quality, Streams, *Pollutant identification, Light.
Identifiers: *Kraft mills, *Subjective evaluation, Color perception, Illumination, Perception thresholds.

The ability of human observers to detect changes in the color of natural waters due to kraft mill effluents was studied. Factors affecting the perception of color changes included the baseline color, illumination intensity, the direction of color change, and the sensitivity and color memory of the observer. In general, increases of 20 and 40 color units in the field were perceived by 50 and 90% of the observers, respectively. The ability to detect decreasing changes was somewhat less. Subjects for further research are discussed. (Buchanan-IPC)
W77-01677

COMPARATIVE STUDIES ON THE ISOLATION OF SALMONELLA FROM EFFLUENTS, (IN RUSSIAN),
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Zoonoses.
E. H. Kampelmacher, Jansen Van Noorle, and M. Lucretia.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 157(1), p 71-77, 1973.

Descriptors: *Salmonella, *Sewage effluents, *Sewage, *Sewage bacteria, *Isolation, Waste water(Pollution), *Enteric bacteria, Separation techniques, Epidemiology, Bacteria, Pollutant identification.
Identifiers: Enterobacteriaceae, Netherlands, Walcheren.

In connection with epidemiological studies on Salmonella cycles in nature, the effluents from 14 sewage treatment plants on the island of Walcheren (Netherlands) were examined over a 6-mo. period. The frequent occurrence of Salmonella, with homogeneous distribution of many bacteria, including a large number of Enterobacteriaceae, made the material particularly suitable for comparative studies of isolation methods of Salmonella from effluents. A description of these methods and the results obtained is given.--Copyright 1974, Biological Abstracts, Inc.
W77-01691

WATER POLLUTION MONITOR,
Process and Pollution Controls Co., Tulsa, Okla. (Assignee).
U. Cirulis, and E. M. Zacharias, Jr.
U.S. Patent No. 3,973,430, 18 p, 13 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 489, August 10, 1976.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Water quality control, *Monitoring, *Measurement, Water pollution sources, Control systems, Acoustics, Sound waves, *Pollutant identification.
Identifiers: Ballast, Tankers, Refinery effluents.

The invention relates to a system and a method of determining the concentration of oil, other petroleum products or hydrocarbons in water. It is used in the measurement of the concentration of oil contained in the ballast liquid carried by tankers and in the measurement of the concentration of petroleum products in the effluent from refineries. The system for comparing the sound velocity characteristics of the contents of the tank being discharged with the sound velocity characteristics of the water being discharged from the same tank is accomplished by dividing a portion of the flow from the tank into a standard and an unknown. The standard is obtained by removing the suspended and undissolved solids and hydrocarbons from the water by mechanical means. This leaves the water principally containing dissolved components as the standard. Both the standard and the unknown sample are run through a common high temperature bath so that they are both at the same temperature, near the point at which the slope of the sound velocity temperature curve is close to zero. The sound velocity in the standard is measured by a sound velocimeter, using a single transducer and a reflector having an acoustic impedance different from that of the water. The sound velocity in the sample is measured by a sound velocimeter which is as identical as possible to the velocimeter measuring the sound velocity in the standard. The received signals are compared to obtain a difference frequency, which is converted to an analog voltage which is proportional to the difference in sound velocity and thus to the concentration of the hydrocarbons in the water. (Sinha-OEIS)
W77-01722

MONITORING GROUND-WATER QUALITY: METHODS AND COSTS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01771

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01772

MONITORING GROUNDWATER QUALITY: DATA MANAGEMENT,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01773

MONITORING GROUNDWATER QUALITY MONITORING METHODOLOGY,
General Electric Co., Santa Barbara, Calif. Cente
for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01775

PROCEEDINGS OF THE FIRST MICROBIOLO GY SEMINAR ON STANDARDIZATION O METHODS, JANUARY 9-11, 1973, SAN FRAN CISCO, CALIFORNIA.
Environmental Protection Agency, Washingtor D.C. Office of Research and Monitoring.
Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-245 13
Price codes: A10 in paper copy, A01 in microfich
EPA Report No. EPA-R4-73-022, March 1973. S S. Verner, editor. 216 p. 6 fig., 19 tab., 204 re
1H1327

Descriptors: *Microbiology, *Standard *Analytical techniques, *Pollutant identificatio *Laboratory tests, *Methodology, Bioindicator Coliforms, *Sampling, Federal Water Pollutio Control Act, Legal aspects, Pathogenic bacteri Viruses, Bacteria, Enteric bacteria, E. Col Sewage bacteria, Fungi, Pathogenic fungi, *Wat quality standards, *Bioassay.

The presentations centered on the efforts of th Environmental Protection Agency to standardiz national sampling methods and laboratory tests identifying microbiological pollutants and poll tion indicators in potable water, recreation waters, marine and estuarine waters. Peripher subjects cover the role of the microbiologist as witness in court proceedings related to enforc ment of the Federal Water Pollution Contr Amendments of 1972, and the investigations co ducted in the microbiological sphere by the EP Office of Research and Monitoring. Other co tributions detail the methodology in identifyi and laboratory testing of coliforms, fec coliforms, fecal streptococci and their applicabil ty in water quality measurement; discussed al are virus detection and zoomicrobes as pollutio indicators. Discussions of the methodology f enumerating Pseudomonas aeruginosa, fungi a the role of fungi as a pollution indicator, identific tion and detection of Salmonella, and the impa of microbial seeding for oil spill degradation fo low. Sample collection precedures in water a sediments, the survival of bacterial samples, sa pling devices used in sediments and water, a quality control in laboratory testing concluded t seminar. Discussions follow each presentatio (Auen-Wisconsin).
W77-01781

PROGRAM FOR PREVENTING AN ELIMINATING OIL POLLUTION OF THE BU FALO RIVER,
Calspan Corp., Buffalo, N. Y.
R. C. Ziegler.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-249 51
Price codes: A07 in paper copy, A01 in microfich
Report No. EPA-600/2-76-029, February 1976. 1 p. 56 fig., 3 tab., 17 ref. 11020 DJG. WPRD 263-0 68.

Descriptors: *Oil pollution, *Water pollution tre ment, Technology, Rivers, Barriers, Samplin Telemetry, Sewers, Obstruction to flow, Cost Emulsions, *New York, Flotsam, Skimmin Siphons, Surfactants, Remote sensin *Indicators, *Pollutant identification.
Identifiers: *Buffalo River(NY), Sensors, Pne matic barriers.

Details are given of equipment and techniqu developed to alleviate oil pollution in an industr watercourse, such as the Buffalo River, Ne York. Surface oils can be effectively restrained combinations of pneumatic barriers in low flowi currents. Surface-active piston films direct

films from confined areas, condense, thicken and guide their motion; they are also useful for preventing shoreline impaction of wind-driven slicks and for improving the operating efficiencies of skimmers. The best design for skimming oil slicks is a suction type skimmer head followed by an oil-from-water separation system, and a separate debris retrieval lift operated from a boat. For detecting oil in sewers, a device based on the ultra-violet transmission characteristics of oil is capable of sensing oil dispersed over the range of 5 to 10,000 ppm or oil films ranging in thickness from a few microns to about 1 millimeter. Also developed were radio frequency and heat conductivity sensors which can detect massive oil accumulations from a few millimeters to several meters thick. The sensors are compatible with narrow-based, low-duty-cycle telemetry which permits central readouts. The best technique to identify and sample oils is chloroform extraction in conjunction with around-the-clock monitoring. The inverted siphon sanitary sewer design is nearly 100% effective for trapping domestic and industrial surface oils but it has almost zero efficiency for trapping emulsified oils. (Auen-Wisconsin).
W77-01782

SUBTIDAL CONCRETE PILING FAUNA IN MONTEREY HARBOR, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
W. Donat.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-016 573, Price codes: A05 in paper copy, A01 in microfiche. Master's thesis, September 1975. 83 p. 18 fig., 4 tab., 19 ref.

Descriptors: *Marine animals, *Marine algae, *Fouling, *Concrete piles, *California, Varieties, Biomass, Water pollution, *Pollutant identification.
Identifiers: *Monterey harbor(Calif).

Fouling organisms were collected and identified from a wharf concrete piling in Monterey Harbor, California. Collections were made over the piling's length from the lowest part of the intertidal zone to the bottom 7.1 m below zero tide level. The piling was dominated by Metridium senile and dense colonies of Phoronis vancouverensis at intermediate depths, with Phyllochaetopterus prolifica occupying the shallow depths. Species of Protozoa, Porifera, Coelenterata, Platyhelminthes, Nemertea, Sipuncula, Annelida, Arthropoda, Mollusca, Bryozoa, Phoronida, Echinodermata, and Cherdata as well as the algae Phaeophyta and Rhodophyta are tabulated as to size, depth distribution and abundance. Species are identified to phyla and drawings illustrate the more prominent animals. (Auen-Wisconsin)
W77-01783

NATIONAL EUTROPHICATION SURVEY METHODS 1973-1976.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 886, Price codes: A05 in paper copy, A01 in microfiche. Working Paper No. 175, June 1975. 94 p. 4 tab., 12 ref., 6 append. 1BA029.

Descriptors: *Eutrophication, *Surveys, *Sampling, *Data collections, Statistical methods, Testing procedures, Investigations, Analytical techniques, Lakes, Streamflow, Drainage area, Nutrients, Tributaries, Outlets, Sewage effluents, Septic tanks, Precipitation(Atmospheric), Algae, Bioassay, Quality control, Runoff, Laboratory tests.
Identifiers: *Nutrient sources, *Nutrient loads.

Field investigative procedures of the Environmental Protection Agency National Eutrophication Survey, as used in the last three years of their study in selected freshwater lakes, are comprehensively described. Included are details of field sampling methods for lakes and reservoirs, streams and municipal sewage treatment plants; analytical methods; nutrient analyses; Geological Survey estimates of stream flows and drainage areas; and estimates of nutrient loadings from tributaries and outlets, municipal wastewater treatment plants, septic tanks and precipitation. Also described are algal assays, algal identification and enumeration methods and various quality control and field techniques utilized by the laboratories which participated in the study. (Harris-Wisconsin)
W77-01787

NATIONAL EUTROPHICATION SURVEY: DATA ACQUISITION AND LABORATORY ANALYSIS SYSTEM FOR LAKE SAMPLES,
Environmental Monitoring and Support Lab., Las Vegas, Nev.
J. W. Mullins, R. N. Snelling, D. D. Moden, and R. G. Seals.
Report No. EPA-600/4-75-015, November 1975. 26 p. 10 fig., 3 append. 1BA029.

Descriptors: *Sampling, *Eutrophication, *Surveys, *Data collections, Testing procedures, Investigations, Analytical techniques, Water analysis, Laboratory tests, Quality control, Chemical analysis, Phosphorus, Nitrogen, Laboratory equipment.
Identifiers: *Autoanalyzer, STORET computer system.

Elements of the system utilized for data acquisition and laboratory analysis for the Environmental Protection Agency National Eutrophication Survey in their study of eutrophication in selected freshwater lakes, are comprehensively described. Details are provided for field measurement and data recording, station description codings, sample controls, laboratory analysis and data management via the STORET system. Appendices include sample data forms, a detailed description for analyzing nitrogen and phosphorus with the Technicon Triple Channel AAII Autoanalyzer and storet parameter codes. (Harris-Wisconsin)
W77-01788

RELATIONSHIPS BETWEEN ZOOPLANKTON DISPLACEMENT VOLUME, WET WEIGHT, DRY WEIGHT, AND CARBON,
Woods Hole Oceanographic Institution, Mass.
P. H. Wiebe, S. Boyd, and J. L. Cox.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 723, Price codes: A02 in paper copy, A01 in microfiche. Fishery Bulletin, Vol. 73, No. 4, p. 777-786, 1975. 5 fig., 4 tab., 19 ref. NR 083-004. N00014-66-C-0241; NSF GA-29303.

Descriptors: *Zooplankton, *Biomass, *Measurement, Correlation analysis, Weight, Carbon, *Pollutant identification.
Identifiers: Wet weight, Dry weight.

Interconversion of various measures of zooplankton biomass have considerable utility in studies requiring nondestructive techniques or for interpretation of past data. In establishing predictive relationships between such measures, the appropriate regression to use is the geometric mean estimate, which provides a regression line where the regression of X on Y and Y on X are identical. Using both data derived from samples collected from diverse oceanic areas and from literature this type of analysis was employed in determining that statistically significant relationships exist between carbon, wet weight, displacement volume, and dry weight when a constant technique is used. The slope of the regression line for log transformed values for carbon vs. dry weight and wet weight vs. displacement volume was sufficiently close to unity to assume a straight percentage conversion between these values. Carbon was 31-33% of dry weight and wet weight was 72-73% of displacement volume. Comparability of different techniques for a biomass measurement may be poor, especially in displacement volume and wet weight measurements due to variations in the interstitial water content. Moreover, interstitial water content varies inversely with total biomass density which accounts for the absence of a simple percentage relationship between wet weight and displacement volume and other measures of zooplankton biomass. (Auen-Wisconsin)
W77-01790

BIOLOGICAL INVESTIGATIONS OF TUTTLE CREEK RESERVOIR, KANSAS,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Field Investigations Branch.
For primary bibliographic entry see Field 5C.
W77-01794

SUSPENDED SEDIMENT DETERMINATION IN ESTUARINE WATERS FROM PHOTOMETER AND SECCHI DISC MEASUREMENTS,
Naval Academy, Annapolis, Md.
J. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-018 278, Price codes: A02 in paper copy, A01 in microfiche. Report USNA-EPRD-16, September 1975. 12 p. 1 tab., 5 ref.

Descriptors: *Analytical techniques, *Turbidity, *Suspended load, *Photometry, *Secchi disks, Estuaries, Measurement, Chesapeake Bay, On-site data collections, Surface waters, Suspended solids, *Pollutant identification.

To arrive at quantitative expressions of transmitted light, reflected light, and absorbed light as affected by suspended solids, a water body is divided into a large number of very thin 'plates.' Each plate has a unit cross-sectional area but is limited in its thickness so that no particle shades any other within a single plate. By relating the transmitted, reflected, and absorbed light for each plate to the suspended particles, mathematical expressions may be derived by stacking a large number of plates and summing the cumulative effect of the relationship between particle size and concentration and the optical parameters of relative irradiance and beam transmittance. By including the effects of multiple scattering, the portion of light scattered in a backward direction is calculated and turbidity parameters are consequently related to the relative irradiance loss coefficient and the attenuation coefficient. These are directly obtainable from photometer and Secchi disc measurements. The method is suitable to any situation where a single type of suspensoid material predominates, such as in areas of high erosion or active dredging. Because of the in situ nature of the measurements and the fact that single determinations of this type have a built in volume averaging property, this method has potential for wider applications. (Auen-Wisconsin)
W77-01795

1975 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Northern Ireland Dept. of Agricultural, Antrim.
For primary bibliographic entry see Field 5C.
W77-01804

THE DEMONSTRATION AND STANDARDIZATION OF A METHOD FOR MONITORING THE ECOLOGICAL EFFECTS OF MARINE WASTE DISCHARGES.
Biome Co., Inc., Surfside, Calif.
California State Water Resources Control Board Publication No. 54, April 1974. 96 p., 23 fig., 4 tab., 79 ref., 1 append.

Descriptors: *Monitoring, *Biota, *Outfall sewers, *Dispersion, *Bioassay, Sewage effluents, Standing crops, Oceans, California, Buoys, Coasts, Productivity, Biological communi-

ties, Chlorinated hydrocarbon pesticides, Heavy metals, Testing procedures, *Pollutant identification, Path of pollutants.

An improved method for monitoring the effects of sewage outfalls and dispersion of effluents off the California coast consists of simple and inexpensive line buoys which permit exposure of ceramic panel substrates in ocean depths down to at least 200 feet. The substrates are nonpigmented ceramic panels 10 cm x 10 cm x 3/8 in. A 6- to 12-ft vertical interval was required to delineate the dispersion area during periods of complex stratification. Four sets of buoy stations were deployed in the Pacific Ocean for 92-day periods, approximately 4.5 miles offshore at the terminus of the Orange County Sanitation District's Ocean Outfall No. 2. Parameters derived from the biomass analysis included gross productivity, the absolute and relative frequences of some species and species groups, the relative chlorinated hydrocarbon levels, and the relative heavy metal levels. Productivity was equivalent to the biomass of the common hydroid, Obelia dichtoma. Gross productivity was inhibited in the waste dispersion field. Buoy station losses were 50% to 60% thus the number of stations deployed should compensate for losses. The float costs ranged between $30.00 for the largest to $20.00 for the smallest. The data from an adequate array of stations should make it possible to plot the mean position of the waste dispersion field. (Auen-Wisconsin)
W77-01806

INVESTIGATION OF LASER RAMAN SPECTROSCOPY FOR ANALYSIS OF WATER QUALITY,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
F. G. Ullman.
Nebraska Water Resources Research Institute, Lincoln, Completion Report, June 1976. 21 p, 4 fig, 5 ref. OWRT A-035-NEB (1). 14-34-0001-6029.

Descriptors: Water quality, Pollutants, *Herbicides, *Pollutant identification, Water analysis, *Analytical techniques, *Nitrates, *Sulfates, *Spectroscopy, Ion exchange, Pesticide residues.
Identifiers: *Laser Raman spectroscopy, Atrazine, Picloram, Trifluoralin, Amiben, Dicamba.

Laser Raman spectroscopy was studied as a tool for analysis of water quality. Lower limits for the detection of nitrates and sulfates in distilled water were determined to be 20 ppm and 8.5 ppm respectively. The herbicides atrazine, picloram, trifluoralin, amiben and dicamba (primarily in methano solutions as the solubility of most of these in water is very low) were also investigated. Atrazine could be detected down to 750 ppm (as atrazine). Trifluoralin absorbed most of the incident light at the two test laser frequencies so a spectrum could not be obtained and the spectra of the other herbicides were obscured by their own fluorescence. At the lower limit of detectability of nitrate and sulfate ions, the impurity signal is obscured by a 'background' signal that can be as large as a few orders of magnitude above the intrinsic background of the instrument. These 'background' signals are reported in the literature to be characteristic of liquid solvents. This unavoidable background forces a lower limit on the utilization of Raman spectroscopy for studying impurities in unconcentrated water samples. Further studies were made on concentrated samples, prepared by reversible ion exchange using an ion exchange resin. Concentration by this method appears feasible. However, the reproducibility of removal and recovery of the desired ion has not been completely established. The relative merits of this technique for studies of water quality are discussed.
W77-01817

NITRATE AND PHOSPHATE: TIME-TREND CONCENTRATIONS IN SELECTED KANSAS STREAMS,
Kansas Water Resources Research Inst. Manhattan.
For primary bibliographic entry see Field 5B.
W77-01818

TRACE METAL DETECTION IN AQUATIC ENVIRONMENTS BY ACTIVATION ANALYSIS OF NAIAD SHELLS,
Ohio State Univ., Columbus. Dept. of Zoology.
W. E. Carey.
Ohio Water Resources Center, Columbus, Completion Report 442X, July 1976. 46 p, 26 fig, 6 tab, 15 ref. OWRT A-028-OHIO (1).

Descriptors: *Metals, *Neutron activation analysis, Mollusks, Radioisotopes, Calcium, Strontium, Sodium, Manganese.
Identifiers: Biological monitors, Species effect, Age effect.

This study investigated the feasibility of using neutron activation analysis of aquatic mollusk shells to measure quantities of trace metals in water. A generalized approach to estimating the sensitivity of a particular metal/irradiation facility/assay system was developed. Radiation hazard to both activation analysts and subsequent users of irradiated museum specimens was investigated and found to be minimal. A sample preparation technique was developed to separate annual shell layers. Three species of naiads (Quadrula q. quadrula, Amblema p. plicata, and Pontamilus alatus) were used to determine that there is no significant species effect on the concentration in the shell of the four elements investigated (calcium, manganese, strontium, and sodium). Similarly, there was no significant variation in concentration with the sex of the collected individual. The age of the collected individual did affect the concentration in the shell of both manganese and sodium, but had no significant effect on calcium or strontium concentration. Finally, a boat was designed and assembled for the specific purpose of collecting naiads from a river system. The equipment is described in some detail.
W77-01820

ON-LINE SURVEILLANCE OF INDUSTRIAL EFFLUENTS EMPLOYING CHEMICAL-PHYSICAL METHODS OF FISH AS SENSORS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
W. P. Bonner, and E. L. Morgan.
Research Report No. 51, August 30, 1976. 64 p, 5 fig, 13 tab, 30 ref, 2 append. OWRT B-030-TENN. (1). 14-31-0001-4160.

Descriptors: *Monitoring, Measurement, *Industrial wastes, Water pollution control, *Toxicity, *Bioindicators, *Pollutant identification, *Respiration, Fish physiology, *Tennessee, River basins.
Identifiers: *Duck River basin(Tenn), Biological monitoring system.

A physiological response of fish, namely, breathing rate, was used to monitor an industrial effluent to detect toxic concentrations of pollutants. Remote sensing devices and associated electronic equipment detected the breathing rate and provided an electrical signal to alert plant personnel of possible discharge problems. During the test period the plant effluent failed to cause an alert; however, mock spills provided an alert as predicted. Parameters tested were flow, temperature, pH, salinity, hydrofluric acid, phenol, calcium fluoride, and phossy water (water that has come in direct contact with large quantities of molten phosphorus). Chemical physical monitors were used to determine the source of those pollutants which are easily monitored. Both monitoring systems have their advantages and disadvantages; however, when used together they can be a useful tool in providing an early warning of toxic conditions and a useful tool in the management of water resources.
W77-01823

IDENTIFICATION OF MAJOR PROCESSES IN BIOTRANSFORMATIONS OF PETROLEUM HYDROCARBONS AND TRACE METALS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01870

EVALUATION STRATEGIES OF METAL POLLUTION IN OCEANS,
University of Southern California, Los Angeles. Environmental Engineering Program.
K. Y. Chen, and R. A. Lockwood.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE2, p 347-359, Proceedings paper No. 12023, April 1976. 2 fig, 5 tab, 10 ref.

Descriptors: *Bioassay, *Dissolved solids, *Environmental engineering, *Sediments, *Surface runoff, *Trace elements, Coastal engineering, Waste water(Pollution), *Metals.
Identifiers: Settling, Elutriation, Solids, Ocean environments, Marine engineering.

The ecological significance of metal inputs into the ocean from different sources are evaluated with six parameters in addition to the conventional analysis of total concentration and mass emission rate from a waste stream. The parametric approaches include: (1) the association of heavy metals with settleable solids--partition between solid and solution phase; (2) settling characteristics of solids in waste streams and their effects on the subsequent distribution of metal species; (3) correlation of metal contents in different size fractions of particles with metals enrichment in the proximity of the discharge area; (4) chemical elutriation in relation to bioavailability; (5) effects of mixing, dispersion, and settling of suspended particulates on the release of trace metals; and (6) bioassay and chemical analysis to determine the toxicities and food chain enrichment potentials of particulate waste stream or elutriates or of specific solid chemical species. (Bell-Cornell)
W77-01875

CHEMICAL AND BIOLOGICAL QUALITY OF WATER IN PART OF THE EVERGLADES, SOUTHEASTERN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-02013

AN EVALUATION OF METHODS FOR MEASURING ALGAL GROWTH,
Geological Survey, Doraville, Ga.
W. T. Shoaf, and B. W. Lium.
Journal of Research of the U S Geological Survey, Vol 4, No 4, p 497-504, July-August 1976. 9 fig, 3 tab, 7 ref.

Descriptors: *Algae, *Growth rates, *Analytical techniques, *Plant growth, *Bioassay, Surface waters, Cultures, Biological properties, Biomass, Standing crops, Fluorescence, Chlorella, Chlamydomonas, Water quality, *Methodology, Evaluation, Measurement, Pollutant identification.
Identifiers: *Algal growth potential, Image analysis, Particle counter.

Three methods for measuring algal growth are described: (1) Algal growth was expressed as milligrams dry weight per liter with use of the electronic particle counter for determining cell number and cell volume. A gravimetric constant in milligrams dry weight per cubic micrometer was deter-

nined. This constant was applicable throughout he growth curve since there was a linear relationship between total cell weight and total cell volume. Chlorella vulgaris and Selenastrum capricornutum exhibited similar growth curves when growth was expressed as cells per liter or as milligrams dry weight per liter; (2) The image analysis system was used to count different types of algae in a mixed culture. C. reinhardtii, C. vulgaris, and Anacystis nidulans were not grossly distorted by the sample preparation method and could be distinguished from one another by variations in morphology. The counts could be separated by computing the ratio of area to length for each particle and by allowing the computer to sort and count each of the three types; (3) Fluorescence was a sensitive measure of growth on a laboratory prepared medium since there was a logarithmic relationship between fluorescence and cells per milliliter for both C. vulgaris and S. capricornutum. Fluorescence measurements were not satisfactory for determining growth in samples of varying chemical composition because the chlorophyll-to-cell ratio varied with media composition. (Woodard-USGS)
W77-02018

NDEXES ASSOCIATED WITH INFORMATION THEORY IN WATER QUALITY,
Geological Survey, Menlo Park, Calif.
. M. Zand.
ournal Water Pollution Control Federation, Vol 8, No 8, p 2026-2031, August 1976. 1 fig, 1 tab, 13 ef.

Descriptors: *Water quality, *Biochemistry, Biological communities, *Distribution patterns, Ecosystems, Evaluation, *Bioindicators.
dentifiers: *Diversity index, Species.

n many biological studies of water quality, a iversity index is calculated in 'bits per individual' sing Shannon's approximation to Brillouin's formula. Short-comings associated with such use of hannon's formula and its associated parameters re discussed. It is suggested that: (1) biological ample collection and analysis be standardized rior to use for comparison of diversity indexes nd their associated parameters among various quatic systems, (2) diversity index be measured n 'sits per individual' rather than the presently sed unit of 'bits per individual', and (3) to evalute the uniformity of distribution of individuals mong species in a sample, relative evenness be sed. Values of diversity indexes using Brillouin nd Shannon formulas, both in bits and sits per individual, and relative evenness are given for 16 ypothetical samples. (Woodard-USGS)
W77-02025

LIMNOLOGICAL SURVEY OF SACONY CREEK BASIN, BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
. L. Barker, and K. P. Kulp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 270, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-84, August 976. 39 p, 4 fig, 9 tab, 20 ref.

Descriptors: *Aquatic environment, *Benthos, Fish populations, *Water quality, Watersheds(Basins), *Pennsylvania, Limnology, Biomass, Sampling, *Data collections, Evaluation, *Pollutant identification.
dentifiers: *Sacony Creek basin(Pa), Berks County(Pa).

Samples of water, fish, and benthic macroinvertebrates collected at 10 sampling stations over a 0-month period indicate that Sacony Creek and ts major tributaries in Berks County, Pennsylvania, possess water of good to excellent quality. No excessive quantities of dissolved nutrients, oxidizable matter, or fecal coliform bacteria were detected. Fish inhabitants include a sizable wild trout population in the upper Sacony basin and a diverse warm-water population, dominated by white suckers (Catostomus commersoni), in the lower basin. A population of 590 trout or 119 pounds per acre was estimated for good habitat in the upper basin. A maximum standing crop of 558 pounds per acre was measured at one of the more productive reaches. Benthic macroinvertebrate collections tended to support the water chemistry and fish population studies. Diversity and redundancy ranged from 2.44 to 3.46 and 0.14 to 0.38, respectively. Such diversity and redundancy values indicate good quality water at all stations. (Woodard-USGS)
W77-02026

EVALUATION OF THREE COLLECTING METHODS FOR A RECONNAISSANCE OF STREAM BENTHIC INVERTEBRATES,
Geological Survey, Menlo Park, Calif., and Geological Survey, Anchorage, Alaska.
K. V. Slack, J. W. Nauman, and L. J. Tilley.
Journal of Research of the U S Geological Survey, Vol 4, No 4, p 491-495, July-August 1976. 5 tab, 16 ref.

Descriptors: *Water quality, *Benthic fauna, *Invertebrates, *Sampling, *Methodology, Evaluation, Alaska, Streams, *Pollutant identification.
Identifiers: *Taxa, Chironomidae, Plecoptera.

Information on benthic invertebrates is increasingly included in water-quality investigations. A 1-day reconnaissance of the Dietrich River, Alaska, included collection of benthic invertebrates. Three methods were used at each of five stations to increase sampling effectiveness and to evaluate each method. Chironomidae and Plecoptera comprised 91 percent of all individuals and 47 percent of all taxa in the combined faunal list. At each station, the most abundant organisms were taken by all methods but the less abundant ones by only one or two methods. The dip net collected the highest percentage of taxa, and the second highest percentage of individuals. The 10-rock method collected the highest percentage of individuals but was relatively ineffective for taxa. The drift net collected the fewest individuals, but the percentage of taxa was relatively high. Of the 27 unique taxa (those taxa collected by only one of the methods), 15 were collected by dip net, 8 by drift net, and 4 by the 10-rock method. Although the dip net was most effective for collecting taxa, more thorough scrubbing of substrates to remove clinging organisms probably would improve the techniques. (Woodard-USGS)
W77-02028

WATER RESOURCES OF THE RAINY LAKE WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02032

WATER RESOURCES OF THE LITTLE FORK RIVER WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02033

PANEL 'A' - AUTOMOTIVE EMISSIONS,
For primary bibliographic entry see Field 6G.
W77-02052

CONTROL OF AMBIENT SO2 CONCENTRATIONS BY NONCONTINUOUS EMISSION LIMITATION LARGE COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Muscle Shoals, Ala. Air Quality Branch.
For primary bibliographic entry see Field 6G.
W77-02059

5B. Sources Of Pollution

TRANSFORMATION OF CHEMICAL SUBSTANCES IN WATER BODIES AND DURING WATER TREATMENT AS A HYGIENIC PROBLEM, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5F.
W77-01552

VERTICAL DISTRIBUTION OF STRONTIUM-90 AND CESIUM-137 IN BOTTOM DEPOSITS OF RIVERS AND LAKES, (IN RUSSIAN),
K. P. Makhon'Ko, Ts. I. Bobovnikova, A. S. Avramenko, A. V. Dibtseva, and A. A. Volokitin.
Ekologiya 6(3), p 90-93, 1975.

Descriptors: *Spatial distribution, *Strontium radioisotopes, *Cesium, *Radioactivity, Bottom sediments, Lake sediments, Rivers, Lakes, Fallout, *Path of pollutants, Water pollution sources.

The maximum concentrations of 137Cs are observed at the surface of bottom deposits of river stretches with very weak currents due to the predominance of sorption over desorption. The 137Cs is predominantly desorbed in river stretches with strong currents, resulting in decreased concentration of the isotope in the surface layer. 90Sr is more easily washed out of the surface of bottom deposits than 137Cs, leading to an increased 137Cs/90Sr ratio. In nonflowing lakes the maximum isotope concentrations are observed on the surface of the bottom deposits, and in flowing lakes they are deeper due to washing out of the isotopes from the surface layer. A second concentration peak of 137Cs and 90 Sr was observed at a depth of about 0.5m; it is probably related to the period of intense radioactive fallout in 1963.
W77-01560

EVALUATION OF THE SELF-PURIFYING ABILITY OF WATERS OF THE LOWER DON, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5G.
W77-01569

STUDY ON THE CHARACTERISTIC DISTRIBUTION OF PHOSPHATE IN JUNHAE BAY, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
C. K. Park.
Bull Korean Fish Soc 8(2), p 68-72, 1975.

Descriptors: *Phosphates, *Distribution, *Fertilizer, Water quality, Bays, *Path of pollutants, Oysters, Fisheries, Asia.
Identifiers: *Junhae Bay(So. Korea).

The effect of wastewater from a chemical fertilizer plant on water quality in Junhae Bay, South Korea, was studied from Feb.-Dec. 1927. Phosphate distribution was significantly higher inside than outside the bay. Phosphate concentration was highest in Hengam Bay where the chemical fertilizer plant was located, and it gradually diffused to the whole bay area. At station 28 the mean value of phosphate was more than 10 times greater than that in 1967 when the fertilizer plant was constructed. In Geoje Bay, the center of oyster culture, phosphate concentration was lower than outside the bay.
W77-01571

CONSIDERATIONS ON THE WASTE WATER QUALITY AND TREATMENT AT THE AN-

TIBIOTICS PLANT FROM JASSY, (IN HUNGARIAN),
For primary bibliographic entry see Field 5D.
W77-01580

SURFACE WATER POLLUTION-THE CATCHMENT AREA AT SANDEFJORD, (IN NORWEGIAN),
Norsk Institutt for Vannforskning, Blindern.
O. Lindholm, and P. Balmer.
Vatten 31(3), p 253-264, 1975.

Descriptors: *Monitoring, Combined sewers, Rainfall, Watersheds(Basins), Basins, *Path of pollutants, *Fjords, Phosphorus, Nitrogen, Lead, Suspended solids, Organic matter, Biochemical oxygen demand, Chemical oxygen demand, Water pollution.
Identifiers: *Sandefjord(Norway).

Monitoring of pollution in the discharge from a catchment area of 380 ha in Sandefjord, Norway, served by a combined sewer system were performed during 7 rainfall events. The catchment consists of 70 ha farm land, 30 ha downtown areas and 280 ha of one-family houses. In the catchment area 9000 persons reside; additional loads are equivalent to the load of 600 persons. The annual additional load caused by wet weather periods is expressed as a percentage of the ordinary annual load of the sanitary sewage: 7-day biochemical O2 demand, 58%; chemical O2 demand, 63%; total P, 17%; total N, 12%, suspended solids, 332%; and Pb. 167%. The intensity of the pollutants being washed out decreased with the time from the start of the rainfall. Pollutant transport in a certain time correlated to the level of water discharge at the same moment. The content of suspended solids, organic matter and Pb in the runoff was correlated to the period of dry weather preceeding the rainfall. Suspended solids and organic matter followed the first flush principle.
W77-01587

THE DEPENDENCE OF ASSIMILATION NUMBER AND CHLOROPHYLL CONCENTRATION ON WATER PRODUCTIVITY IN DIFFERENT TEMPERATURE AREAS OF THE WORLD OCEAN, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5C.
W77-01591

PHYTOPLANKTON DISTRIBUTION IN THE SCOTIA SEA AS RELATED TO VERTICAL WATER CIRCULATION, (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
O. A. Movchan.
Okeanologiya 15(4), p 708-712, 1975.

Descriptors: *Phytoplankton, Distribution, Water circulation, *Atlantic Ocean.
Identifiers: *Scotia Sea.

In phytoplankton material from the Scotia Sea (South Atlantic), maximum quantities of phytoplankton were found in the areas of the most intensive vertical water circulation and high stability of the water layers, i.e., under conditions characteristic of frontal zones. The phytoplankton maximum ware recorded in the upwelling zone and in the sinking zone.
W77-01592

THE SPECIES, SIZE AND AGE COMPOSITION OF FISHES IN DONETS PART OF WARM WATER SEWAGE BY LUGANSK STATE REGIONAL ELECTRIC POWER STATION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
For primary bibliographic entry see Field 5C.
W77-01608

QUALITY OF GROUND WATER IN THE COASTAL AQUIFER NEAR VISAKHAPATNAM, INDIA,
Andhra Univ., Waltair (India). Dept. of Geophysics.
V. V. Jagannadha Sarma, and N. Krishnaiah.
Ground Water, Vol. 14, No. 5, p 290-295, September-October 1976. 3 fig, 3 tab, 9 ref.

Descriptors: *Water quality, *Coasts, *Groundwater, Aquifers, Water wells, Sampling, Brackish water, Geologic control, Hydrogeology, Saline water intrusion, Sea water, Calcium, Magnesium, Chlorides, Bicarbonates, Hydraulic gradient, Conductivity, Hardness(Water), Alkalinity.
Identifiers: *India, *Ghyben-Herzberg relation, Ratios, Sodium adsorption ratio.

A study of the quality of groundwater from 250 open wells in the coastal aquifer of Kaniti-Paravada near Visakhapatnam, India brought out the fact that the occurrence of highly brackish waters in certain localized pockets is due to the hydrogeological processes going on in the area and not due to the influence of the sea. The phenomenon was verified by determining standard ratios of tracing sea-water contamination like Ca/Mg, Cl/HCO sub 3 and T sub A/T sub H. Conductivity and sodium adsorption ratio were also determined for finding out the alkali hazard to supplement the observations. (Visocky-ISWS)
W77-01626

THE MINERALOGY AND GEOCHEMISTRY OF THE SEDIMENTS OF NORTHWESTERN LAKE VICTORIA,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-01630

GRAVITATIONAL CIRCULATION IN LONG ISLAND SOUND,
State Univ. of New York at Stony Brook, Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W77-01634

DETERMINING THE SOURCE OF NITRATE IN GROUND WATER BY NITROGEN ISOTOPE STUDIES,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 5A.
W77-01636

EVALUATION OF THE USE OF SALT BRINE FOR DEICING PURPOSES,
Connecticut Dept. of Transportation, Rocky Hill, Materials Testing Lab.
For primary bibliographic entry see Field 4C.
W77-01639

WASTE WATER CONTROL – DEMONSTRATED FOR A RIVER PROFILE (ABWASSERKONTROLLE – DEMONSTRIERT AN EINEM FLUSSPROFIL),
Leykam-Muerztaler A. G., Gratkorn (Austria).
U. Wischenbart.
Das Papier, Vol. 30, No. 7, p 295-302, July, 1976. 12 fig, 2 tab.

Descriptors: *Water pollution, *Pulp wastes, Rivers, River flow, Water pollution sources, Wastes, *Industrial wastes, Foreign countries, Streams, Europe, *Monitoring, *Chemical oxygen demand, *Biochemical oxygen demand, Streamflow, Seasonal, Industrial wastes, Municipal wastes, Lignins, Running waters, *Waste assimilative capacity.
Identifiers: *Mur River(Austria), Austria, Lignosulfonates.

An approximately 300 km section of the Mur River in Austria was monitored at 12 points with respect to effluent loading to establish a pollution profile. The role of various industries as well as municipalities was determined. Daily peak loads were observed, and the behavior of introduced polluting agents over intermediary stretches of the river was followed, with particular attention being paid to the action of pulp mill effluents. By determining transported daily loads, comparisons for different seasons and different levels of flow could be made. The extensive data obtained were used in correlating COD and BOD values to calcium lignosulfonate contents. (Speckhard-IPC)
W77-01648

TOXIC CONSTITUENTS IN WOODROOM EFFLUENTS,
B. C. Research, Vancouver (British Columbia).
A. B. McKague, J. M. Leach, R. N. Soniassy, and A. N. Thakore.
In: Canadian Wood Chemistry Symposium, September 1-3, 1976, Mont Gabriel, Quebec, Canada. Canadian Pulp and Paper Association, Montreal, Quebec, p 129-135. 6 fig, 28 ref, 3 tab.

Descriptors: *Toxicity, *Bark, *Industrial wastes, *Water pollution sources, Wastes, Effluents, Pine trees, Fir trees, Anaerobic digestion, Waste water treatment, Waste treatment, Pulp wastes, Pulp and paper industry, Organic acids.
Identifiers: *Groundwood mills, Spruce trees, Resin acids, Wood extractives, Fatty acids.

Principal toxic components in effluents from wet debarking of spruce, pine, and fir species were abietic, palustric, dehydroabietic, neoabietic, isopimaric, pimaric, and sandaracopimaric resin acids. Oleic, linoleic, and linolenic acids were minor toxic contributors to the acidic materials in some effluent samples. Neutral extractives, such as abienol, 13-epimanool, (12E)-abienol, pimarol, and isopimarol accounted for the remaining toxicity of softwood debarking waste streams. Abienol was converted to tetrahydroepimanool during anaerobic fermentation of woodroom effluents. (Sykes-IPC)
W77-01667

CHEMISTRY OF WEST COAST GROUNDWOOD EFFLUENT TOXICITY,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5C.
W77-01668

PHENOLIC AND CHLOROPHENOLIC OLIGOMERS IN CHLORINATED PINE KRAFT PULP AND IN BLEACH PLANT EFFLUENTS,
State Univ. of New York at Syracuse. Empire State Paper Research Inst.
M. Erickson, and C. W. Dence.
In: Canadian Wood Chemistry Symposium, September 1-3, 1976, Mont Gabriel, Quebec, Canada. Canadian Pulp and Paper Association, Montreal, Quebec, p 75.

Descriptors: *Bleaching wastes, *Phenols, Effluents, *Gas chromatography, Aromatic compounds, Organic compounds, Water pollution sources, Softwood, Pine trees, Pulp wastes, Wastes, Chlorination, Oxidation, Mass spectrometry, Effluents, Separation techniques, Industrial wastes, *Pollutant identification, Lignins.
Identifiers: *Kraft pulp, Potassium permanganate, Chlorine compounds, Alkaline extraction.

Chlorinated softwood kraft pulp was washed with dilute HCl and subsequently extracted with alkali. The undiluted spent chlorination and caustic extraction liquors and the corresponding pulps were oxidized with potassium permanganate to convert the oligomeric phenolic residues contained therein to monomeric aromatic carboxylic acids which were then identified using combinations of gas

chromatographic and mass spectrometric echniques. Eleven phenolic derivatives were de-ected in the spent chlorination liquors corresponding to 3.6 and 6.0% chlorine applica-ions). Thirteen phenolic derivatives were dentified in the spent caustic extraction liquors. Chlorinated pulps contained the same phenolic ypes as the chlorination liquors but in higher total concentrations. Permanganate oxidation of the caustic-extracted pulp revealed that all but traces of the phenolic substances had been removed in he combination of chlorination and extraction stages. (Sykes-IPC)
W77-01669

THE INFLUENCE OF TRICKLE IRRIGATION ON THE QUALITY OF IRRIGATION RETURN FLOW,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 5G.
W77-01680

THE EFFECT OF PARK USE ON SURFACE WATER QUALITY,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 5C.
W77-01692

ARTESIAN AQUIFERS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W77-01761

MONITORING GROUND-WATER QUALITY: METHODS AND COSTS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
L. G. Everett, K. D. Schmidt, R. M. Tinlin, and D. K. Todd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 133, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Monitoring Series, EPA-600/4-76-023, May, 1976. 141 p, 30 fig, 18 tab, 125 ref.

Descriptors: *Monitoring, Data collections, *Measurement, *Groundwater, *Costs, *Vadose water, Wells, *Water quality, Aquifer characteristics, Water analysis, Water chemistry, Water temperature, Test procedures, Model studies, Methodology, Pollutant identification, *Water pollution sources.
Identifiers: *Saturated zone, *Unsaturated zone, *Groundwater monitoring costs.

Most ground-water monitoring programs have concentrated on the saturated zone for indications of pollution. These programs usually do not consider supplemental information that is available through analyzing the unsaturated zone and the land surface. A number of techniques have been developed for monitoring water movement and water quality in the topsoil and unsaturated zone. These techniques include shallow wells, neutron moderation or moisture logging, tensiometers, electric resistance blocks, piezometers, psychrometers, tracers, fiberglass probes, lysimeters, suction cups, and salinity sensors. Monitoring of the land surface can be divided into nonsampling and sampling methods. The non sampling methods can be further divided into wasteload inventory considerations, leaching potential calculations, pipeline and tank tests, artificial liner testing, aerial surveillance, and notification and emergency procedures. The sampling methods are divided into those for surface water bodies, wastewater, and solid wastes. Saturated zone monitoring methods are tailored for predicting groundwater movement and the determination of geochemical considerations which affect natural ground water quality. These methods are grouped in the general areas of water levels, groundwater movement, pump tests, water budgets, groundwater modeling and water temperature and chemical water quality studies. (Heiss-NWWA)
W77-01771

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 936, Price codes: A05 in paper copy, A01 in microfiche. EPA Environmental Monitoring Series, EPA-600/4-76-036, July, 1976. 82 p, 18 fig, 8 tab, 37 ref. R. M. Tinlin (editor).

Descriptors: Water pollution, *Water pollution sources, *Groundwater, *Monitoring, Data collections, Measurement, Arkansas, New York, Connecticut, Arizona, California, Oxidation lagoons, Industrial wastes, Oil fields, Nitrates, Brines, Septic tanks, Landfills, Leachate, Sewage, Pollutant identification.
Identifiers: *Oil-field brines, *Plating wastes, *Landfill leachate.

Five case histories of actual on potential groundwater pollution are presented with the monitoring techniques which were employed as well as a restrospective view of these techniques and their efficacy. The case histories cover brine disposal in Arkansas, industrial chrome plating waste contamination in Long Island, New York, landfill leachate pollution in Milford, Connecticut, an oxidation pond near Tucson, Arizona, and multiple-source nitrate pollution in the Fresno-Clouis, California metropolitan area. Four hypothetical illustrative examples for developing and selecting monitoring alternatives based on cost comparisons between other alternatives and hydrologic judgment are also given. These include agricultural effluent return flow, septic tank effluent contamination, percolation pond pollution, and solid waste landfill contamination. (heiss-NWWA)
W77-01772

MONITORING GROUNDWATER QUALITY: DATA MANAGEMENT,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
N. F. Hampton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 492, Price codes: A04 in paper copy, A01 in microfiche. EPA Environmental Monitoring Series, EPA-600/4-76-019, April, 1976. 63 p, 4 fig, 10 tab, 30 ref.

Descriptors: *Data storage and retrieval, *Data transmission, *Monitoring, *Groundwater, Aquifers, Aquifer characteristics, California, Colorado, Texas, Tennessee, *Pollutant identification, *Water pollution sources, *Water quality.
Identifiers: *Groundwater data management, Water quality data.

Effective ground-water quality management requires that relevant data be available to the manager in a concise, comprehensive, timely, economical and reliable manner. The prevalent proximity of the ground-water manager to the source of the data as well as the specialized needs of individual users indicates that decentralized (localized) ground-water data management systems are appropriate. A centralized (federal) data management system is called for as well, for the coordination of the national effort, the provision of interim ground-water data management support, the achievement of economics of scale and the encouragement of local compliance with national ground-water monitoring requirements. Consequently, the development of comprehensive ground-water information management capabilities should be implemented at the Federal, State and, where necessary, at local levels. The volume of data likely to be involved at the federal level dictates the need for a computerized system, below the federal level this may not be required. Some states, however, have already developed a computerized capability to maintain ground-water surveillance data (California, Colorado, Texas and Tennessee). Data indexing and the management of document citations are capabilities which can be provided,to agencies below the federal level, by existing federal systems. (Heiss-NWWA)
W77-01773

PROCEDURES MANUAL FOR MONITORING SOLID WASTE DISPOSAL SITES,
Wehran Engineering Corp., Middletown, N. Y.
D. Fenn, and E. Cocozzan.
United States Environmental Protection Agency, Office of Solid Waste Management Programs, 1976. 287 p, 61 fig, 15 tab. 68-01-3210.

Descriptors: *Landfills, *Monitoring, *Groundwater, *Water pollution, *Leaching, *Water quality, Control systems, Data collections, Maintenance, Administrative agencies, *Waste disposal, Leachate, Costs, Pollutant identification, Publications.
Identifiers: *Sanitary landfill monitoring, Monitoring costs, Monitoring program implementation.

More than 90 percent of our Nation's solid waste is deposited in or on the land surface for disposal. Leacate from this volume of waste is a serious problem in the areas of ground and surface water pollution. Ground-water pollution by leachate is insidious and requires a monitoring system to detect and delineate areas affected. Monitoring is implemented in two basic ways; the monitoring of existing sites, where ground-water contamination has already occured, and monitoring at new sites where no contamination has occured. Strategy for enforcement of monitoring must be formulated and implemented on a policy basis for state and municipal monitoring agencies. The limitations of monitoring must be delineated for the monitoring site. Contaminates measured and levels must be considered in the monitoring system design. The cost monitoring is a major factor in any system design. Costs will vary directly with the purpose and therefore the level of the monitoring program. In order to establish an effective state program, it must proceed simultaneously with enforcement and locating alternatives with a systematic approach and a good data base. The state must possess a working knowledge of the hydrogeological setting and the probable extent of contaminant transport at all existing landfill sites. By these considerations and use of a step outline of monitoring procedures listed, a state or local monitoring system can be planned, implemented, and maintained. (Heiss-NWWA)
W77-01774

MONITORING GROUNDWATER QUALITY: MONITORING METHODOLOGY,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
D. K. Todd, R. M. Tinlin, K. D. Schmidt, and L. G. Everett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 068, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Environmental Monitoring Series, EPA-600/4-76-026, June, 1976. 154 p, 52 fig, 15 tab, 119 ref.

Descriptors: *Monitoring, Water pollution control, *Groundwater, *Aquifers, *Pollution abatement, *Water pollution sources, Data collections, Networks, *Methodology, Water quality, Pollutant identification.
Identifiers: *Groundwater monitoring methodology, *Monitoring programs.

The basic purpose of a monitoring methodology for monitoring ground water pollution is to provide

a framework for the planning and development of a monitoring program. Source monitoring, which involves the measurement of effluent quantity and quality for pollution sources which may affect groundwater is the primary monitoring methodology used. The methodology should serve to assist local monitoring agencies in the design and implementation of a monitoring program, and to guide state and national governmental agencies in establishing realistic monitoring priorities. The ground-water pollution monitoring program should include the following 15 steps. (1) Selection of a monitoring area, (2) Identification of pollution sources, (3) Identification of potential pollutants, (4) Definition of ground-water usage, (5) Definition of the hydrogeologic situation, (6) A study of existing ground-water quality, (7) An evaluation of infiltration potential for waste at the land surface, (8) An evaluation of the mobility of pollutants from the land surface to the water table, (9) An evaluation of attenuation of pollutants in the saturated zone, (10) A prioritization of sources and causes, (11) An evaluation of existing monitoring programs, (12) Establishment of alternative monitoring approaches, (13) Selection and implementation of the monitoring program, (14) Review and interpretation of monitoring results, and (15) Summarization and transmission of monitoring information. These steps taken together constitute a monitoring methodology which can assist a monitoring agency of any location to initiate a groundwater pollution monitoring program. (Heiss-NWWA)
W77-01775

A MANUAL OF LAWS, REGULATIONS, AND INSTITUTIONS FOR CONTROL OF GROUND WATER POLLUTION,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-01776

WATER POLLUTION INVESTIGATION: GENESEE RIVER AND ROCHESTER AREA,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
For primary bibliographic entry see Field 5C.
W77-01785

WATER POLLUTION INVESTIGATION: BUFFALO RIVER,
Versar, Inc., Springfield, Va. General Technologies Div.
For primary bibliographic entry see Field 5C.
W77-01786

SEASONAL ABUNDANCE AND HORIZONTAL DISTRIBUTION OF PLANKTONIC CRUSTEACEA OF GEORGIAN BAY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01799

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF GEORGIAN BAY AND NORTH CHANNEL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01800

THE DEMONSTRATION AND STANDARDIZATION OF A METHOD FOR MONITORING THE ECOLOGICAL EFFECTS OF MARINE WASTE DISCHARGES.
Biome Co., Inc., Surfside, Calif.
For primary bibliographic entry see Field 5A.
W77-01806

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS,
Wisconsin Univ. - Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-01810

NITRATE AND PHOSPHATE: TIME-TREND CONCENTRATIONS IN SELECTED KANSAS STREAMS,
Kansas Water Resources Research Inst. Manhattan.
P. Hulen, and E. Angino.
Completion Report, KWRRI Contribution No. 176, Aug 1976. 51 p, 32 fig, 3 tab, 23 ref. OWRT A-074-KAN(1). 14-34-0001-6017.

Descriptors: *Phosphates, *Nitrates, *Kansas, Water quality, Rivers, *Water pollution sources, *Path of pollutants, Time of concentration, Forecasting, River forecasting, Data collections, Pollutant identification.
Identifiers: *Time-Trend concentrations(Stream pollutants), Republican River(Kan), Arkansas River(Kan), Kansas River(Kan).

A review of the historical data (Water Quality Records) for 13 selected rivers draining different parts of the State of Kansas were examined to determine: (1) whether an increase in the NO3 - PO4 concentration in streams over time occurs, (2) to determine the rate of increase, and (3) to use the data to provide guidance on future trends. Data on phospate concentrations in Kansas streams are scarce. The PO4 concentration is approximately on the order of a magnitude lower than that of nitrate. The PO4 time-trends indicated do provide cause for concern in the future. This is especially so for the Republican River at Concordia and the Arkansas River at Dodge City. Mean nitrate concentrations in many Kansas streams show an increasing trend in the period 1962-1974. The greatest rate of increase of mean nitrate concentration with time is for the Arkansas River at Dodge City. For the Kansas River at Bonner Springs and Marais de Cygnes at Ottawa the nitrate level is decreasing. Overall it seems doubtful from the time-trend data examined for nitrate that future increases would exceed those presently indicated.
W77-01818

SHALLOW GROUND-WATER SALINIZATION IN DRYLAND FARM AREAS OF MONTANA,
Montana Univ., Missoula. Dept. of Geology.
G. R. Thompson, and S. G. Custer.
Montana University Joint Water Resources Research Center Report No. 79. Montana State University, Bozeman, September 1976. 214 p, 21 fig, 15 tab, 205 ref, 7 append. OWRT-A-094-MONT (1). 14-34-0001-6027.

Descriptors: *Groundwater, *Water pollution, *Salinity, Soil conservation, Sodium, Magnesium, Sulfates, Nitrates, Ammonium compounds, *Montana, *Water chemistry, Bacteria, Cultivation.
Identifiers: *Saline seep, Eastern Montana, Summer fallow, Colorado shale, *Groundwater salinity.

Saline seeps have developed on 106,000 ha in Montana between 1954 and 1975 due to excess percolation of water below the rootzone in response to irrigation and summer fallow. The ground water below paired cultivated and uncultivated dryland-farm sites on Colorado Group shale near Rapelje, Stillwater County, Montana, contains about 9000 ppm total dissolved solids at both sites and is dominated by sodium, magnesium, calcium and sulfate. Bedrock environment of deposition, weathered and unweathered mineralogy, exchangeable cations, and ground-water chemistry indicate that the salinity source is rock weathering. Nitrate is present in ground water (1505 kg/ha) below cultivated land and is absen below uncultivated land. The only source whic quantitatively accounts for the profile excess i conversion of organic nitrogen to nitrate by bac teria in response to increased aeration an moisture content due to cultivation. Consideratio of excess deep percolation, lithology, and surfac and subsurface topography provide a basis fo identifying seep-prone areas at the local leve Moisture management with new croppin techniques remains the key to amelioration of th saline seep problem. (Stuart-Montana State)
W77-01822

ON-LINE SURVEILLANCE OF INDUSTRIA EFFLUENTS EMPLOYING CHEMICAL-PHYSI CAL METHODS OF FISH AS SENSORS,
Tennessee Technological Univ., Cookeville. Dept of Civil Engineering.
For primary bibliographic entry see Field 5A.
W77-01823

POLLUTION OF THE RIVER TYNE ESTUARY -THE USE OF MATHEMATICAL MODELS,
Newcastle-upon-Tyne Univ. (England). Dept. o Civil Engineering.
A. James.
Journal of the Institute of Water Pollution Control Vol. 75, No. 3, p 322-340, 1976. 24 fig, 1 tab.

Descriptors: *Water pollution control *Mathematical models, *Dissolved oxygen *Nutrients, *Rivers, *Estuaries, Hydraulics Tides, Salinity, Biochemical oxygen demand Equations, Systems analysis, Path of pollutants.
Identifiers: *River Tyne Estuary(Great Britain) North Sea.

During the past 15 years, the Civil Engineering De partment of the University of Newcastle upo Tyne has carried out numerous studies of condi tions in the estuary of the River Tyne. The stud results have been formulated into mathematica models to help gain a numerical insight into th causes of present conditions and predict th results of future policies. This paper deals with th mathematical analysis and interpretation of th results obtained by Gay, Head, Ratasuk an James; included are details of methods. The wor fell into three categories: dissolved oxygen stu dies; nutrient studies; and bacteriological studies Herein, the first two are considered. At the end o the article are a discussion and a reply to th discussion. (Bell-Cornell)
W77-01889

AGRICULTURAL WATER POLLUTION: SOM PROBLEMS ASSOCIATED WITH ITS CON TROL,
Kansas Univ., Lawrence. Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-01898

THE EFFECT OF THE NON-IDEAL COMPOSI TION OF SEA WATER ON SALINITY AN DENSITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2L.
W77-01911

EFFECTS OF URANIUM MINING AN MILLING ON GROUND WATER IN TH GRANTS MINERAL BELT, NEW MEXICO,
Office of Radiation Programs, Las Vegas, Nev.
For primary bibliographic entry see Field 5C.
W77-01923

EVIDENCE OF SALT-WATER INTRUSION I SOUTHEASTERN LONG ISLAND,
Wisconsin Univ., Madison. Dept. of Geology an Geophysics.
M. P. Anderson, and C. A. Berkebile.

Ground Water, Vol. 14, No. 5, p 315-319, September-October 1976. 6 fig, 2 tab, 19 ref.

Descriptors: *Well data, *New York, *Groundwater, *Saline water intrusion, Groundwater movement, Chlorides, Wells, Hydrology, Hydrogeology, Water table, Networks, Sampling.
Identifiers: *Long Island, Groundwater level, Firewells.

A pre-existing network of 124 wells used for fire protection in the Town of Southampton, Long Island, New York, was monitored during a one-year period for groundwater levels and chloride concentrations. Water from 26 wells had chloride concentrations of 50 mg/l or greater, and in 17 of the wells, the chloride concentration exceeded 200 mg/l. Of the mentioned 26 wells, nineteen were located in two densely populated areas. The possibility of widespread intrusion in the wells of one of the densely populated areas had not been previously documented. In addition, detailed water table contour maps were presented for selected areas within the town. (Lee-ISWS)
W77-01924

DISPERSION OF POLLUTANTS IN THE STRAIT OF CANSO,
Nova Scotia Technical Coll., Halifax. Dept. of Chemical Engineering.
S. T. Wang, A. F. McMillan, and B. H. Chen.
Water Resources Bulletin, Vol. 12, No. 4, p 779-797, August 1976. 8 fig, 12 ref.

Descriptors: *Path of pollutants, *Mathematical models, Pollutants, *Straits, *Diffusion, *Dispersion, *Water circulaton, *Canada, *Atlantic Ocean, Model studies, Water pollution, Path of pollutants, Harbors, Channels, Coasts, Mixing, Movement, Winds, Wind tides, Waves(Water), Wind velocity, Chemical reactions, Equations.
Identifiers: *Strait of Canso, *Nova Scotia, Deepwater ports.

By using the method of successive approximations, the one-dimensional diffusion equation was solved for the distribution of pollutant from an instantaneous point source in a semi-infinite body of water under the influence of wind-generated waves. The solution was obtained with the aid of an expression developed in this study to relate the dispersion coefficient to wind speed, characteristics of a wind-generated wave, and drift current velocities. The results indicated that the wave causes the local concentration to oscillate with respect to time around a mean concentration distribution curve. The period of the oscillation is about that of the wave, and its amplitude is always less than 7% of the mean. The effect of a chemical reaction is to reduce the level of pollutant concentration, the magnitude of the reduction being dependent upon both the rate constant and the order of reaction. The case of simultaneous dumping of one pollutant at different sites was also considered. (Bender-ISWS)
W77-01928

OPTIMAL ESTIMATION OF DO, BOD, AND STREAM PARAMETERS USING A DYNAMIC DISCRETE TIME MODEL,
Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
A. J. Koivo, and G. Phillips.
Water Resources Research, Vol. 12, No. 4, p 705-711, August 1976. 9 fig, 10 ref.

Descriptors: *Path of pollutants, *Model studies, *Optimization, *Biochemical oxygen demand, *Dissolved oxygen, *Streams, *Mathematical models, Computer models, Dynamic programming, Organic matter, Water quality, Water pollution, Pollutants, Reaeration, Self-purification, Waste assimilative capacity, Equations, Mathematical studies.
Identifiers: *Streeter-Phelps model, *Optimal estimation, Kalman filter.

A modified Streeter-Phelps equation was used as the starting equation to obtain a discrete time mathematical representation which represents a model for the biological oxygen demand and the dissolved oxygen concentrations in a polluted stream. The unknown parameters to be estimated were treated as state variables in order to compute their numerical values from noise-corrupted measurements. An optimal estimator was constructed for the estimation of the unknown parameters. The optimization scheme can be implemented in a small computer. The approach was illustrated by a numerical example. (Bender-ISWS)
W77-01930

AN ANALYSIS OF INSTABILITIES CAUSED BY SALINITY GRADIENTS IN GROUNDWATER,
Florida Univ., Gainesville. Dept. of Civil Engineering.
H. Rubin.
Journal of Hydraulic Research, Vol. 14, No. 3, p 217-228, 1976. 4 fig, 14 ref, append.

Descriptors: *Salinity, *Groundwater, *Convection, *Density, Stability, Groundwater movement, Velocity, Aquifers, Dispersion, Circulation, Equations, Flow, Boundary processes, Mathamatical studies, Permeability, Viscosity, Reynolds number, Currents(Water).
Identifiers: *Salinity gradients, Salinity transport, Flow field, Unperturbed velocity, Rayleigh number, Nusselt number.

Salinity gradients in groundwaters may lead to convection currents. The present study concerned stability criteria of the flow field as well as an analysis of the salinity transport due to finite amplitude disturbances. It was found that convection cells are always two dimensional rolls whose axes are parallel to the unperturbed velocity vector. Salinity transport through the aquifer is considerably increased due to the convection motion. Mechanical dispersion due to the convection motion reduces the intensity of salinity transport. (Visocky-ISWS)
W77-01931

CHARACTERIZATION OF URBAN RUNOFF - NEW JERSEY,
Rutgers - The State Univ., New Brunswick N.J. Water Resources Research Inst.
W. Whipple, Jr., J. V. Hunter, and S. L. Yu.
Partial Completion Report, June 1976. 89 p, 26 fig, 43 tab, 24 ref. OWRT C-5341(4239)(4).

Descriptors: *Water pollution sources, *Heavy metals, *Phosphates, *Storm water, *Urban hydrology, *Urban runoff, *Land use, Water pollution, Biochemical oxygen demand, Pollutants, Sediment yield, Nutrients, *New Jersey, Suspended solids, Organic loading.
Identifiers: Urban runoff pollution, Nonpoint pollution sources, *Saddle River(NJ).

Pollution from urban runoff in the Saddle River, N.J. was determined; specifically heavy metals, BOD, phosphates and suspended solids were measured. Techniques include use of single samples and of samples taken at short intervals throughout storm events. Results are compared to different types of land use, showing more pollution of all types from urban and industrial runoff than from residential area runoff. No relationship was found between pollution loadings and the length of time since the preceding storm. This finding is contrary to a usual assumption in modelling urban runoff pollution.
W77-01945

MATHEMATICAL MODELING FOR WATER QUALITY MANAGEMENT IN STREAMS UNDER UNSTEADY HYDRAULIC CONDITIONS,
Tennessee Univ., Knoxville. Dept. of Environmental Engineering.
D. E. Overton, and M. E. Meadows.
Tennessee Water Resources Research Center, Knoxville, Research Report No. 55, October 26, 1976. 119 p, 22 fig, 68 ref, 3 append. OWRT A-036-Tenn(1), 14-31-0001-5043.

Descriptors: *Dissolved oxygen, *Unsteady flow, Numerical methods, Water quality, Dispersion, *Mathematical models, Streamflow, *Model studies, Water management(Applied), Organic loading, Path of pollutants, Water pollution control.

For the purposes of water quality management studies, a rational mathematical model of the response of a stream water quality system to the wide range of waste inputs and streamflows is required. A one dimensional model describing the stream dissolved oxygen levels in time and space has been developed that is valid for any combination of steady and unsteady organic waste inputs and streamflow conditions. This model was formulated in terms of the principal source and sink for dissolved oxygen, atmospheric reaeration and biochemical oxygen demand, respectively. Additional sources and sinks may be combined linearly when appropriate. The unsteady hydraulics are described by the unsteady streamflow equations which are solved simultaneously with the coupled equations for dissolved oxygen. Solution of these four partial differential equations is best obtained through numerical integration techniques. A proven implicit integration scheme was chosen for the solution of the unsteady streamflow equations. The two equations profiling the dissolved oxygen were integrated using a four-point explicit scheme. The stability and accuracy of this numerical method has been demonstrated. A numerical experiment was conducted to demonstrate the model applicability for simulation of the effects of periods of unsteady streamflow on stream water quality. Results of the unsteady flow model were compared with the results of a steady flow model and conclusions drawn as to possible errors introduced by assuming steady flow.
W77-01946

SOUTHEASTERN FORESTS AND THE PROBLEM OF NON-POINT SOURCES OF WATER POLLUTION,
Forest Service (USDA), Franklin, N. C. Coweeta Hydrologic Lab.
J. E. Douglass.
In: Non-Point Sources of Water Pollution, Southeastern Regional Conference Proceedings 1975, May 1-2, 1975, Blacksburg, Virginia, Donaldson Brown Continuing Education Center, Virginia Polytechnic Institute and State University, Blacksburg, p. 29-44. 86 ref.

Descriptors: *Water pollution control, *Soil erosion, *Channel erosion, *Sedimention, Thermal pollution, Pesticide residues, Public health, Water quality, Runoff, *Southeast US, Path of pollutants, *Forest management, *Erosion control.

The 1972 Amendments to the Federal Water Pollution Control Act require that non-point source pollution from forestry activities be controlled. Erosion is the most serious pollutant originating from forestry activities. Activities which destroy the forest floor and reduce the infiltration rate of soil, such as mechanically preparing sites for tree planting, roads, skid trails, and logging decks, cause most accelerated erosion. Elevation of water temperature, changing the chemical composition of water by cutting or fertilizing stands, and introduction of pesticides and herbicides into streams are other common forms of pollution. Pollution from forestry operations can be minimized by utilizing existing information. However, there is need for additional quantification of pollution levels associated with alternative forestry practices, and for screening of known or development of new techniques for minimizing non-point source pollution. (Forest Service)
W77-01952

A MODEL FOR CALCULATING EFFECTS OF LIQUID WASTE DISPOSAL IN DEEP SALINE AQUIFERS, PART I--DEVELOPMENT.
Geological Survey, Austin, Tex.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256-903, Price codes: A12 in paper copy, A01 in microfiche. Water-Resources Investigations 76-61, June 1976. 263 p, 20 fig, 18 tab, 35 ref. Contractor: INTERCOMP Resource development and Engineering, Inc., Houston, Texas.

Descriptors: *Waste disposal, *Injection wells, *Computer models, *Aquifer characteristics, Deep wells, Saline water, Aquifers, Industrial wastes, Water pollution control, Groundwater movement, Model studies, Equations, Mass transfer, *Path of pollutants.
Identifiers: *Subsurface waste-disposal model.

A transient, three-dimensional subsurface waste-disposal model has been developed to provide methodology to design and test waste-disposal systems. The model is a finite-difference solution to the pressure, energy, and mass-transport equations. Equation parameters such as viscosity and density are allowed to be functions of the equations' dependent variables. Multiple user options allow the choice of x, y, and z cartesian or r and z radial coordinates, various finite-difference methods, iterative and direct matrix solution techniques, restart options, and various provisions for output display. The addition of well-bore heat and pressure-loss calculations to the model makes available to the ground-water hydrologist the most recent advances from the oil and gas reservoir engineering field. (Woodard-USGS)
W77-02010

NITROGEN AND PHOSPHORUS UPTAKE IN THE EVERGLADES CONSERVATION AREAS, FLORIDA, WITH SPECIAL REFERENCE TO THE EFFECTS OF BACKPUMPING RUNOFF,
Geological Survey, Tallahassee, Fla.
B. F. McPherson, B. G. Waller, and H. C. Mattraw.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028-796, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 76-29, June 1976. 120 p, 21 fig, 10 tab, 17 ref.

Descriptors: *Absorption, *Water quality, *Nitrogen, *Phosphorus, *Florida, *Marshes, Canals, Water conservation, Chemical analysis, Chemical properties, Biological properties, Dissolved oxygen, Nutrients, Trace elements, Aquatic plants, Sediments, Hydrology, Water supply.
Identifiers: *Everglades, *Everglades National Park, Water conservation areas, *Backpumping runoff.

In much of the water pumped into the northern Everglades, Florida, concentrations of inorganic nitrogen and phosphorus are relatively high. These nutrients are transported in the canals or into the peripheral marshes. Concentrations decrease sharply within 330 feet or less of the canals, whereas specific conductance remains essentially unchanged within this distance. The sharp decrease in inorganic nitrogen and phosphorus near the canal edge indicates net uptake in these shallow waters. Concentrations of nitrogen and phosphorus also decrease as water moves through the conservation areas in canals. This decrease is due partly to dilution by rainfall and runoff, and partly to net uptake in the canals and their peripheral marsh. The large canals of the northern and eastern parts of the conservation areas often have relatively low concentrations of dissolved oxygen which show little fluctuation within 24 hours. Backpumping 50 percent of the total annual canal runoff in southeast Florida would add from 990 to 6,160 tons of nitrogen and from 10 to 62 tons of phosphorus to the conservation areas. The bottom sediments of the Everglades are a sink for nitrogen and phosphorus. They can, however, be a source of these nutrients when anaerobic conditions exist at the water-sediment interface or when bottom material becomes resuspended. (Woodard-USGS)
W77-02012

CHEMICAL AND BIOLOGICAL QUALITY OF WATER IN PART OF THE EVERGLADES, SOUTHEASTERN FLORIDA,
Geological Survey, Tallahassee, Fla.
B. G. Waller, and J. E. Earle.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028-795, Price codes: A08 in paper copy, A01 in microfiche. Water-Resources Investigations 56-75, December 1975. 157 p, 17 fig, 20 tab, 23 ref.

Descriptors: *Water quality, *Surface waters, *Florida, *Chemial analysis, *Environmental effects, Land use, Chemical properties, Biological properties, Physical properties, Bottom sediments, Water chemistry, *Path of pollutants, *Pollutant identification.
Identifiers: *Everglades, *Everglades National Park, *Lake Okeechobee.

The quality of surface water in the agricultural area between Lake Okeechobee and the water conservation areas is markedly different from that of other surface water in southeastern Florida. Man has engaged in cultural activities, both agricultural and urban, which have affected the water quality in the northern and eastern segments of the area of investigation. The quality of the water improves, however, as it flows to the south and east because there is minimal input from man's activities and many of the constituents are assimilated by plants, sorbed on organic material and clay in the bottom sediments, and entrapped within the sediments. Because of these processes, the water entering Everglades National Park is of better quality than that entering the conservation areas in the north. (Woodard-USGS)
W77-02013

INDEXES ASSOCIATED WITH INFORMATION THEORY IN WATER QUALITY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W77-02025

HYDROLOGICAL AND HYDRAULICAL CONCEPTUAL MODELS APPLICABLE TO OVERLAND AND RIVER TRANSPORT MODELING,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-02036

STATEMENT OF CONCERNS OF THE LAKE MICHIGAN TOXIC SUBSTANCES COMMITTEE RELATED TO POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Chicago, Ill.
For primary bibliographic entry see Field 5C.
W77-02038

PICHIA SPARTINAE, A DOMINANT YEAST OF THE SPARTINA SALT MARSH,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 5C.
W77-02039

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION,
Interstate Commission on the Potomac River Basin, Bethesda, Md.
For primary bibliographic entry see Field 5G.
W77-02053

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION: NON-POINT SOURCES AND COST EFFECTIVENESS,
Enviro-Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5G.
W77-02057

THE EFFECTS OF WATER POLLUTION FROM NON-POINT SOURCES AS IT RELATES TO THE HEALTH OF MAN,
Health Science Associates, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5G.
W77-02058

ARKANSAS RIVER WATER QUALITY RELATED TO THE IRRIGATION POTENTIAL OF ASSOCIATED SOILS,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
L. H. Hileman.
Arkansas Dept. of Commerce, Little Rock. Final Report, December 1974. 101 p, 46 fig, 7 tab, 12 ref, 5 append.

Descriptors: *Irrigation effects, *Soil contamination, *Soil analysis, Irrigation water, *Arkansas, Rates of application, Soil chemistry, Soil types, Soil classification, Sodium, Calcium, Magnesium, Leachate, Salts.
Identifiers: Arkansas River(Ark), Arkansas River Valley(Ark).

The effect of levels of sodium and other salts on soil chemical properties of the various soil types adjacent to the Arkansas River was studied to determine whether water from the Arkansas River could be used for irrigation purposes. Undisturbed soil cores three inches in diameter by twenty-four inches deep were collected from thirteen agriculturally important soil series in the Arkansas River Valley and subjected to gravity leaching. It was concluded that though the soil series varied greatly in their ability to accept irrigation water containing high sodium, high calcium, magnesium, or soluble salts, river water could be used to irrigate many areas in the Arkansas River Valley. Calcium, magnesium, and sodium leached readily through coarse and medium textured soils in proportion to (1) the amount of these elements in the water, (2) the amount of clay in the soil, and (3) soil-water interaction. Generally, the greatest variability in the soil chemical analysis was found in the active root zone or the zero to eight inch soil depth. Sodium and soluble salts accumulated on the surface or in the plant root zone of fine textured or heavy clay soils, restricting their utility for agricultural irrigation. (Luedtke-Wisconsin)
W77-02065

STORMWATER STUDIES AND ALTERNATIVES IN ATLANTA,
Jordan, Jones, and Goulding, Inc., Atlanta, Ga.
R. F. Holbrook, A. I. Perez, B. G. Turner, and H. I. Miller.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE6, Proceedings Paper No. 12614, p 1263-1277, December 1976. 2 fig, 10 tab, 14 ref.

Descriptors: *Combined sewers, *Erosion, *Land use, Urban runoff, *Storm water, Water quality, Computer models, Simulation analysis, Operating costs, Pollutants, Treatment, Alternative planning, Storage, Decision making, Rainfall, Systems analysis, Water management(Applied), Economics, *Georgia, Forecasting.
Identifiers: STORM model, *Atlanta(Geo), Data gathering and analysis, Cost effectiveness.

To identify the contribution of pollutants from urban runoff, a sampling program was established on four small streams in suburban areas of Atlanta. Approximately 100 runoff samples were collected during 15 summer storm events and the

Corps of Engineers' STORM model was calibrated using the quality, quantity, and land-use information obtained. The calibrated model was then utilized to predict pollutant loads (present and future) from 90 watersheds covering the Atlanta Urban area. Synthetic curves were developed to represent discharges from the 10 combined sewer overflows in the Atlanta area. These curves, along with specific site information, were used to identify treatment alternatives. Alternatives were screened and storage volumes and treatment capacities were chosen based on site availability, maximum removal of BOD5 and suspended solids, and public acceptance. Costs were assigned to alternatives at each overflow site and alternatives were chosen based upon cost-effectiveness. (Bell-Cornell)
W77-02073

WASTEWATER STORAGE-SIMULATION OF INSTREAM EFFECTS,
Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort.
J. S. Tapp.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE6, Proceedings paper No. 12601, p 1151-1159, December 1976. 4 fig, 7 tab, 1 ref.

Descriptors: *Water quality, *Waste water disposal, *Simulation analysis, *Dissolved oxygen, *Discharge(Water), Computer models, Water storage, Equations, Biochemical oxygen demand, Systems analysis, Management, *Forecasting.
Identifiers: *Instream effects, Storage pond, Water flow.

Simulations using computer models to predict the instream effects of storing wastewater during periods of low streamflow and releasing during periods of high streamflow indicate that instream dissolved oxygen concentrations can be increased during low flow periods to a level necessary for fish and aquatic life survival. Equations relating allowable wastewater flow at a given effluent quality, streamflow, and temperature were developed as a guide for operating a wastewater storage pond. Without the storage pond in operation, instream dissolved oxygen concentrations were predicted to drop below that necessary for fish and aquatic life survival. With the storage pond in operation, the instream dissolved oxygen concentration was predicted to remain above 3 mg/l, indicating that wastewater storage is an alternative that should be considered when examining situations of low streamflow and high wastewater loading. (Bell-Cornell)
W77-02074

5C. Effects Of Pollution

LAND DISPOSAL OF LIQUID SEWAGE SLUDGE: III. THE EFFECT ON SOIL NITRATE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5D.
W77-01557

ENVIRONMENTAL FACTORS OF HUMAN LEUKEMIAS, (IN POLISH),
K. Janicki.
Polska Akademia Nauk: Kralow, Poland. 1974. 220 p.

Descriptors: *Correlation analysis, *Human diseases, Water supply, Fertilizers, *Environmental effects, Toxicity, Human population, Chemicals.
Identifiers: *Luekemias.

The correlation of leukemia incidence in Cracow, Poland, from 1961-1968 and certain environmental factors is presented. Leukemia incidence is characterized according to geographical area, sex, age and type of leukemia. Environmental factors include population numbers, use of plant-protective chemicals and artificial fertilizers, and water supply. Results are presented in tables and cartograms. Leukemia prophylaxis is discussed. Extensive Russian and English summaries are provided.
W77-01562

ALGAE OF THE LAKE CHAD REGION: I. GENERAL CHARACTERISTICS OF THE ENVIRONMENT, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.
For primary bibliographic entry see Field 2H.
W77-01565

EFFECTS OF CADMIUM AND LEAD UPON THE INDIGENOUS HETEROTROPHIC MICROFLORA IN THE AQUEOUS ENVIRONMENT OF THE BRACKISH ESTUARY-WATER OF THE RIVER WESER, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
D. Thormann.
Veroeff Inst Meeresforsch Bremerhaven, 15(3), p 237-267, 1975.

Descriptors: *Cadmium, *Lead, Estuaries, Brackish water, Europe, Salinity, *Bacteria, Absorption, Toxicity, Estuarine environment.
Identifiers: *River Weser(West Germany), Heterotrophic microflora.

In agar media (10% salinity) containing Cd or Pb bacterial numbers were progressively reduced at 0.5-400 ppm Cd and at 100-400 ppm Pb. Only a few bacteria were able to form colonies at the highest concentrations. Lower salinity and low peptone-yeast-extract-concentrations of the medium increased the toxicity of Pb. The appearance of several brown-black pigmented colonies on the plates containing more than 200 ppm Pb was observed, but no dark pigment was noted when the same bacteria were grown in the absence of Pa. Different concentrations of Cd or Pb were added to water samples (as batch cultures) of the Weser Estuary (West Germany). The development of the indigenous microbial population was observed by subsequent counting of the viable heterotrophic bacteria on agar media. Cd was more toxic than Pb; there were differences in the kind of toxicity. The dissolved concentrations of Cd and Pb in the batch cultures were analyzed by atomic absorption. Cd dissolved considerably better than Pb in brackish water. Cd-and Pb-sensitive bacteria were isolated by a replica plating technique to carry out subsequent experiments on the microbial uptake of heavy metals. The most sensitive bacteria were growth-inhibited at 0.1 ppm Cd and Pb. Arthrobacter marinus is mentioned.
W77-01566

SUBMERSED MACROPHYTES AND THEIR COMMUNITIES AS INDICATORS OF WATER CONTAMINATION,
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany).
A. Kohler.
Beitr Naturkd Forsch Suedwestdtsch, 34, p 149-159, 1975.

Descriptors: *Bioindicators, *Algae, Indicators, Water pollution, Aquatic animals, *Nutrients, Sewage, Oligotrophy, Pollutant identification.
Identifiers: *Macrophytes.

Until recently only animals and algae but not macrophytes were considered as biological water quality indicators. The indicator value of macrophytes appeared to play a part when organic sewage was introduced into uncontaminated oligotrophic water since the bloom shifted. Two types were differentiated. Many submerged macrophytes declined with contamination or disappeared entirely. A second group of submersed macrophytes underwent marked acceleration of vitality and propagation, followed by a dimunition of further growth increase with continuously increased contamination; finally overloading led to a limitation of macrophytes. A third group of submersed macrophytes were relatively insensitive to contamination. Nutrient concentration, sediment variation and turbidity may contribute to the conditional competitive vegetation variation of submersed macrophytes.
W77-01570

WATER QUALITY OF THE CULTURE BEDS OF HARD CLAM AND ADJACENT SEA OF THE YEOSU REFINERY OF HONAM OIL REFINERY COMPANY IN KWANG YANG BAY, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
J. H. Won, and N. P. Go.
Bull Korean Fish Soc, 8(2), p 73-84, 1975.

Descriptors: Oil spills, Water quality, Clams, Oil pollution, Bays, Industrial wastes, Water pollution effects, Organic compounds, Fisheries.

The effects of oil spill from the wastewater of Yeosu Refinery on water quality of hard clam culture beds in Taein-Ri, Kwang Yang Bay, South Korea, were studied. Wastewater and oil spillage may reach culture beds in 6-8 h by tidal current movement. Water quality is nearly as normal as unpolluted sea water except the concentration of n-hexane extractive chemicals which was higher than unpolluted sea water in Sept.-Oct. 1973. It may be caused by wastewater of Yeosu Refinery.
W77-01572

RESEARCHES ON THE BIODEGRADABILITY AND TOXICITY OF SOME POLLUTANTS EXISTING IN WASTE WATERS DISCHARGED BY THE PETROCHEMICAL INDUSTRY, (IN HUNGARIAN),
A. Ilisescu, and L. Stefanescu.
Stud Epurarea Apelor 16(1-7), p 76-98, 1974.

Descriptors: *Biodegradation, *Toxicity, Industrial wastes, Activated sludge, *Organic compounds, Inhibition, Microorganisms, Daphnia.
Identifiers: Gobio, *Petrochemical pollutants, Propylamine, Toluenediamine.

The biodegradability and toxicity of various petrochemical industry wastes were studied. Isobutyl-alde-hyde, alpha-naphthol and isopropylamine are biodegradable; the last 2 compounds require a previous period of acclimatization. Dimethylamine and carbaryl are non-biodegradable and non-toxic for activated sludge microorganisms. Toluylenediamine and p-chloraniline are non-biodegradable and weakly inhibit sludge. For the 4 non-biodegradable compounds, the concentrations at which they do not modify organoleptic properties in river water and the concentrations below which toxic effects on river organisms is absent are listed. Daphnia and Gobio are mentioned.
W77-01581

THE BIODEGRADABILITY OF SOME ORGANIC POLLUTANTS PRESENT IN THE WASTE WATERS RESULTED FROM THE PETROLEUM REFINERIES, (IN HUNGARIAN),
For primary bibliographic entry see Field 5D.
W77-01583

PHYTOTOXIC PROPERTIES OF ANAEROBIC BACTERIA OF IRRIGATED SOILS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
V. I. Duda, and I. I. Chernomorchenko.
Biol Nauki (Mosc) 18(6), p 88-92, 1975.

Descriptors: *Anaerobic bacteria, Irrigated land, Wheat, Toxicity, Organic acids, Soils, Acids.
Identifiers: Acetic acid, Butyric acid, Formic acid, USSR, *Odessa region(USSR), Phytotoxicity.

From irrigated soils of the Odessa region (USSR) 195 cultures of anaerobic bacteria causing soil toxicosis were isolated. The culture liquid of many isolates had a pronounced phytotoxic effect on wheat. The toxicity was caused by organic acids, mainly acetic, butyric and formic, released by the anaerobes. When sterile soil was inoculated with pure cultures of anaerobic bacteria phytotoxic compounds were formed and accumulated in the soil.
W77-01590

THE DEPENDENCE OF ASSIMILATION NUMBER AND CHLOROPHYLL CONCENTRATION ON WATER PRODUCTIVITY IN DIFFERENT TEMPERATURE AREAS OF THE WORLD OCEAN, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
V. I. Vedernikov.
Okeanologiya 15(4), p 703-707, 1975.

Descriptors: *Chlorophyll, Temperature, *Oceans, *Waste assimilative capacity, Productivity, *Primary productivity, *Eutrophication, Mesotrophy, *Phytoplankton.

The most probable (phytoplankton) chlorophyll-a concentrations and assimilation numbers (mg C/mg/h) measured at optimum light intensity were determined for areas of different productivity in the polar, temperate and tropical regions of the World Ocean. When passing from oligotrophic to mesotrophic waters, the increase in primary production is attributed to the increase in the assimilation number and chlorophyll-a content of the water. When passing from mesotrophic to eutrophic waters, only the latter of these 2 values increases essentially.
W77-01591

ASSESSMENT OF CADMIUM IN FISHES FROM CARINTHIAN LAKES, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W77-01593

CHARACTER OF INTERRELATIONS BETWEEN CHIRONOMIDAE AND THEIR PARASITES, MERMITHIDAE, (IN RUSSIAN),
Akademiya Nauk Moldavskoi SSR, Kishinev.
A. A. Spasskii, N. S. Okonyi, and I. K. Toderash.
Dokl Akad Nauk Sssr Ser Biol 222(5), p 1254-1256, 1975.

Descriptors: *Diptera, *Animal parasites, Larvae, Biochemistry, Enzymes, Toxicity, Reservoirs, Insects, Midges.
Identifiers: Chironomus-plumosus, Hydromermis-sp, Imago, *Mermithidae, Metabolites, Moldavian-Ssr, Pupa, USSR, *Dubossary Reservoir(USSR), Dniestr River(USSR).

During a study of the biology of mass species of midges (Diptera, Chironomidae) of the Dubossary reservoir on the Dniestr River in the Moldavian SSR (USSR) intense infection of larvae, pupae and imagoes of Chironomus plumosus by mermithids of the genus Hydromermis was noted. A study of enzyme activity in exudates and homogenates of mermithid larvae indicated that the severe biochemical effects of parasitism may be the cause of death. The possibility of the toxicological effect of metabolites is not ruled out.
W77-01596

HYGIENIC STUDY OF THE TOXIC PROPERTIES OF METHANOL-CONTAINING RECLAIMED WATER, (IN RUSSIAN),
O. F. Ostapenko, V. A. Kryuchkov, A. N. Mal'kuta, V. G. Litau, and V. I. Solov'ev.
Kosm Biol Avia-Kosm Med 9(4), p 23-26, 1975.

Descriptors: *Water reuse, *Toxicity, *Water pollution effects, Rodents, Public health, Water purification.
Identifiers: *Methanol.

No significant changes in male white rats resulted from their 30 day consumption of reclaimed water which contained up to 34 mg/l methanol and was produced by sorption purification of the atmospheric condensate during a prolonged manned experiment.--Copyright 1976, Biological Abstracts, Inc.
W77-01602

CHLOROPHYLL DEGRADATION PRODUCT IN SEDIMENTS OF LAKE TEGA-NUMA, (IN JAPANESE),
S. Kobayashi, and O. Udagawa.
Jpn J Limnol 36(2), p 65-75, 1975.

Descriptors: *Chlorophyll, *Lake sediments, Asia, *Organic matter, *Biodegradation, Correlation analysis, *Spatial distribution, Phytoplankton.
Identifiers: Lake Tega-Numa(Japan).

Vertical distribution of the chlorophyll degradation product (phaeophytin), organic C, organic N and ignition loss in sediments of Lake Tega-numa (Japan) was studied. The content of phaeophytin was greater in the upper layers and decreased remarkably with core depth. The correlation was obtained between organic C and ignition loss, organic N and ignition loss and organic C and organic N. The values of the C/N ratio in sediments was 10-16 in the upper layers and 16-29 in the deeper layers. In the upper layers a correlation was observed between the C/N ratio and the contents of phaeophytin. The origin of organic substances in sediments of Lake Tega-numa is inferred to be phytoplankton in the upper layers and undecomposed plant matter in the deeper layers.
W77-01604

THE SPECIES, SIZE AND AGE COMPOSITION OF FISHES IN DONETS PART OF WARM WATER SEWAGE BY LUGANSK STATE REGIONAL ELECTRIC POWER STATION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
A. Y. Shcherbukha.
Gidrobiol Zh., Vol. 9, No. 3 p 52-57, 1973.

Descriptors: *Fish populations, *Fish, *Inflow, *Growth stages, *Aquatic environment, *Thermal water, *Speciation, *Environemtal effects, Industrial pollution, Fishing, Warm-water fish, Ecotypes.
Identifiers: Severski y, Donets, Lugansk.

In the region of Northern Severskiy Donets, under influence of Lugansk SREP, USSR warm water inflow, immature stages of valuable fish species predominate, with a remarkable increase of mature stages in the non-valuable species yield. This is evidence of unfavorable environmental conditions for the former, and is convenient for the latter. Decrease in the number of fish species and their stock depend on both industrial pollution and overfishing.--Copyright 1974, Biological Abstracts, Inc.
W77-01608

DYNAMICS, STOCK AND FORECAST OF FISH CATCHES IN LAKES OF THE KURA-ARAKS LOWLAND, (IN AZERBAIJANI),
M. O. Akhmedov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 4, p 80-83, 1974.

Descriptors: *Fish harvest, *Forecasting, *History, Lakes, Carp, Perches, Pikes.
Identifiers: Azerbaijan SSR, Bream, Dynamics, Kura-Araks, Roach, Sheatfish, USSR, Lake Adzhikabul, Lake Akgel, Lake Nakhalygchala.

Information is presented on the fish catches in lakes Adzhikabul, Akgel and Nakhalygchala of the Kura-Araks lowland in the Azerbaijan SSR (USSR) during the past 20 yr. The main causes of the decline in the catch of carp, sheatfish, perch-pike, bream and roach are indicated. A forecast of fish catches in the near future is given. By the end of 1977 it may be almost double the 1967-1972 catch.--Copyright 1975, Biological Abstracts, Inc.
W77-01609

COMPARATIVE HYDROECOLOGICAL AND ZOOLOGICAL INVESTIGATIONS IN SOME SUBMERGED PLANT STANDS OF LAKE VELENCE, (IN GERMAN),
Eotvos Lorand Univ., Budapest (Hungary). Inst. of Tiersystem.
For primary bibliographic entry see Field 2H.
W77-01658

RESPONSES OF PHYTOPLANKTON TO RENEWED SOLAR RADIATION IN A STRATIFIED INLET,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
R. R. Parker, and J. Sibert.
Water Research, Vol. 10, No. 2, p 123-128, 1976. 5 fig, 14 ref, 3 tab.

Descriptors: *Phytoplankton, *Humus, *Pulp wastes, *Photosynthesis, *Water pollution effects, Humic acids, Water pollution sources, Wastes, Industrial wastes, *Canada, Foreign countries, Oxygen, Water pollution, Organic compounds, Effluents, Aquatic life.
Identifiers: *Alberni Inlet(British Columbia), Kraft mills.

The hypothesis that humic substances discharged by a pulp mill at the head of Alberni Inlet (British Columbia, Canada) was responsible for an oxygen deficiency by blocking sub-halocline photosynthesis was tested by two experimental methods. In the short term (4-5 hr), no production could be demonstrated using the carbon-14 method and exposing sub-halocline water to light. In the longer term, an intense phytoplankton bloom occurred after a 3-day lag period. It is concluded that removal of humic substances from the pulp mill effluent will result in renewed oxygen production below the halocline. (Witt-IPC)
W77-01659

CHEMISTRY OF WEST COAST GROUNDWOOD EFFLUENT TOXICITY,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
M. Solinas, and E. W. Tunstall.
In: Canadian Wood Chemistry Symposium, September 1-3, 1976, Mont Gabriel, Quebec, Canada. Canadian Pulp and Paper Association, Montreal, Quebec, p 155-157. 3 fig, 4 ref.

Descriptors: *Pulp wastes, *Toxicity, Water pollution sources, Wastes, Industrial wastes, Effluents, Lethal limit, Water pollution effects, Canada, Pacific Coast Region, Hemlock trees, Phenols, Organic compounds.
Identifiers: *Groundwood mills, Western hemlock(Tsuga heterophylla), Hydroxymatairesinol, Alpha-conidendrin, Matairesinol, Conidendrins, Wood extractives.

Hydroxymatairesinol, alpha-conidendrin, and matairesionl were identified in the effluent of a Canadian West Coast groundwood mill. Hydroxymatairesinol was present in lethal concentration and was found to be a major contributor to the toxicity of groundwood effluents where western hemlock (Tsuga heterophylla) is the principal source of fiber. (Sykes-IPC)
W77-01668

OMPARATIVE STUDIES ON THE ISOLA-ION OF SALMONELLA FROM EFFLUENTS, N RUSSIAN),
jksinstituut voor de Volksgezondheid, lthoven (Netherlands). Lab. for Zoonoses.
or primary bibliographic entry see Field 5A.
77-01691

HE EFFECT OF PARK USE ON SURFACE ATER QUALITY,
ax C. Fleischmann Coll. of Agriculture, Reno, ev. Div. of Agricultural and Resource conomics.
T. K. Ching, and G. E. Frick.
rowth and Change, Vol. 5, No. 4, p 15-20, Oc-ber 1974. 1 fig, 2 tab.

escriptors: *Recreation, *Water quality, ttitudes, *Parks, *Least squares method, oliforms, Water temperature, Boating, Ecology, ssolved oxygen, *New Hampshire, *State rks.
entifiers: *Pawtuckaway State Park(NH).

titudinal surveys of residents and a water quali- survey using samples from selected intervals ross the lake and along the shore near swimming eas and shorelines inhabited by property owners re conducted in the Pawtuckaway State Park in uthern NH to determine the impact of park use water quality and on the perceptions of keshore residents regarding environmental quali- Water samples included the following varia-es: dissolved solids, pH, dissolved oxygen, clari- temperature, coliform bacteria, alkalinity and ns. Attitudinal surveys were addressed to oblems of boating, overcrowding, ecology, rk-resident relations and property values. Water ality was found to be suitable for drinking for all ctors except coliform bacteria. On some days liform concentrations were low enough for creational purposes; on other days concentra-ns exceeded the stringent standards set by the te of NH. Mean water quality did not vary sig-icantly among sample points except for water nperature and sodium and potassium concentra-ns. Nine equations (therefore 9 indices) were ed by least squares analysis, with only 5 having nificant F statistics at 5% level. These were uations with dependent variables of water tem-rature, dissolved oxygen, chloride and potassi-. Regression analysis could explain 70-75% of riance in water temperature and chloride con-ntration, and 60% of variance in dissolved ox-en, sodium and potassium. These results in-ate variables other than climate and park use termine water quality. Although problems were pressed by lakeshore residents, the surveys realed that residents do not believe park users largely responsible for those problems. entry-North Carolina)
77-01692

NEFICIAL USE OF THERMAL EFFLUENT LOBSTER CULTURE,
n Diego State Univ., Calif. Dept. of Biology.
F. Ford, J. C. Van Olst, J. M. Carlberg, W. R. rband, and R. L. Johnson.
printed from Proceedings of the Sixth Annual eting, World Mariculture Society, Seattle, shington, January 27-31, 1975, p 509-519, 1976. b, 12 ref.

scriptors: *Aquiculture, *Lobsters, *Water lity, *Water pollution effects, *Thermal pollu-n, California, Temperature.
ntifiers: Thermal effluents, Lobster rearing, rm water effects.

mparative water quality analyses and rearing periments were conducted to assess benefits l problems in using thermal effluent to culture American lobster (Homarus americanus) from egg to market size. Salinity, dissolved oxygen, , and concentrations of the heavy metals Cu, Cd, Co, Pb, Cr, and As were essentially the same in thermal effluent from the Encina Power plant as in ocean water from the outer Agua Hedionda Lagoon and Scripps. Sensitive H. americanus larvae employed to test effluent water quality were cultured individually and in mass rearing systems at constant temperatures of 18.5 and 21.6 C. Larvae reared to Stage IV in Encina effluent and in water from the two ocean sources did not differ significantly in survival or size attained. Similar results were obtained for larvae and juveniles reared to Stage VIII over a 3-month period at 22.1 C. These results suggest that chemical toxicity may not be a problem in using thermal effluent from the Encina Power Plant. Preliminary results indicate that thermal effluent may provide a useful and economical source of warm water for lobster culture. (NOAA)
W77-01707

ENVIRONMENTAL ASPECTS OF A LARGE TROPICAL RESERVOIR - A CASE STUDY OF VOLTA LAKE, GHANA.
Smithsonian Institution, Washington, D. C. Office of International and Environmental Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 630, Price codes: A16 in paper copy, A01 in microfiche. Prepared for the Agency for International Development, September 1974. P.H. Freeman, editor. 360 p. 8 fig, 16 tab, 260 ref, 4 append. AID/csd-2608.

Descriptors: *Impoundments, *Reservoirs, *Tropical regions, *Environmental effects, Geology, Hydrogeology, *Cycling nutrients, Plankton, Aquatic weed control, *Oligotrophy, Fisheries, Water supply, Human diseases, Biocontrol, Sedimentation, Seismic properties, Groundwater, Hydrologic aspects, Water balance, Bathymetry, Salinity, Irrigation, Waste assimilative capacity, Aquatic life, Storage capacity, Navigation, Vectors(Biological), Microclimatology, Electric power production.
Identifiers: *Volta Lake(Ghana), Case study.

The ecological and limnological effects of Volta Lake, an 8500 sq km impoundment on the Volta River in Ghana, were investigated to typify the environmental effects of tropical reservoirs. Comprehensive investigations covered the geology, seismic effects, groundwater, related hydrology, lake topography, water supply, and power generation capacity. Mineral cycling in this oligotrophic body of water was related to fish production, plankton, and aquatic weeds. Runoff nutrient sources are limited due to the poor soils of the region. The beneficial aspects of the aquatic weeds for fish production are contravened by inhibiting navigation and providing substrates for disease vectors. Ceratophyllum harbors Bulinus, the snail vector of urinary schistosomiasis, which is prevalent in 75% of the local populace. Biological control of weeds and the vectors of river blindness (Onchocerciasis), malaria, sleeping sickness (Trypanosomiasis) are evaluated. A mayfly (Povilla) is an effective control agent of Polygonum, a puffer fish may control Geratophyllum, a beetle (Atlica) attacks Ludwigia leptocarpa, a snail (Physa) and a moth (Tortrix) attack Pistia. The only current effective weed-clearing techniques are cutting, hoeing, and burning. The water supply of the lake is of potential importance to the estimated 100,000 persons who live in the vicinity. Wastewater is insignificant in water quality and the assimilative capacity for organic wastes is great. (Auen-Wisconsin)
W77-01779

WATER POLLUTION INVESTIGATION: ASHTABULA AREA,
Calspan Corp., Buffalo, N. Y.
P. M. Terlecky, J. G. Michalovic, and S. L. Pek.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 861, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-905/9-74-008, January 1975. 157 p. 5 fig, 40 tab, 65 ref, 3 append. EPA-68-01-1575.

Descriptors: *Water pollution, *Lake Erie, *Ohio, Industrial wastes, Water pollution control, Chlorine, Mercury, Water temperature, Dissolved solids, Metals, Biota, Water pollution effects, Water chemistry, Permits, Water quality standards, Biomass, Benthos, Monitoring, Pollutants, Conductivity, Coliforms, Waste dilution.
Identifiers: *Ashtabula River(Ohio), *Ashtabula Harbor(Ohio), *Fields Brook(Ohio), Flushing time.

Water quality and biota of the Ashtabula River and Harbor area in Lake Erie at Ohio were studied. An industrial complex discharging into Fields Brook since 1950 has seriously degraded water quality. Total residual chlorine, mercury, high temperatures, dissolved solids, and metals are the most serious pollutants affecting the area. Total residual chlorine ranged from 1-12 mg/l at the mouth of Fields Brook, and mercury values were 1.3-4.8 microgram/l. Dissolved solids were 1495-1612 mg/l, and conductivity was as high as 1850 micromhos/cm in Fields Brook. Calculations of flushing time for Ashtabula Harbor during low flow conditions indicated near stagnation in late summer. A 60-day flushing time for the harbor was postulated under present conditions. Diatoms and phytoplankton found in the harbor and lower river indicated the presence of an eutrophic, pollution tolerant type of community. An indigenous population was absent, suggesting toxic conditions. Low cell counts, biomass, and diversity plus dominance by only a few species at each sampling station indicated a seriously degraded water quality situation. If requirements of NPDES permits are fulfilled, improvement in water quality can be expected. Total residual chlorine, mercury, conductivity, and dissolved solids should be monitored for the next two years. (Buchanan-Davidson--Wisconsin)
W77-01780

PROCEEDINGS OF THE FIRST MICROBIOLOGY SEMINAR ON STANDARDIZATION OF METHODS, JANUARY 9-11, 1973, SAN FRANCISCO, CALIFORNIA.
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 5A.
W77-01781

SUBTIDAL CONCRETE PILING FAUNA IN MONTEREY HARBOR, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5A.
W77-01783

EFFECTS OF SUSPENDED SOLIDS ON SELECTED ESTUARINE PLANKTON,
Maryland Univ., Solomons. Natural Resources Inst.
J. A. Sherk, J. M. O'Connor, and D. A. Neumann.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 653, Price codes: A04 in paper copy, A01 in microfiche. Corps of Engineers, Ft. Belvoir, Virginia, Coastal Engineering Research Center Report No. MR 76-1, January 1976. 50 p. 12 fig., 4 tab., 35 ref., 1 append. G31266. DACW 72-71-C-0003.

Descriptors: *Suspended solids, *Phytoplankton, *Zooplankton, *Photosynthesis, *Feeding rates, Dredging, Copepods, Laboratory tests, Chlorella, Sediment load, Water pollution effects, Estuarine environment.
Identifiers: Eurytemore affinis, Acartia tonsa, Monochrysis lutheri, Nanochloris, Stichococcus.

Laboratory studies of the effects on phytoplankton photosynthesis of suspended mineral solids and resuspended natural sediments, generated by dredging, in cultures of Monochrysis lutheri, Nannochloris, Stichococcus, and Chlorella are described. Also investigated were the effects of

the suspended load on the feeding activity of the calanoid copepods Eurytemora affinis and Acartia tonsa. The experimental suspended sediment concentrations were typical of those found in estuarine systems during flooding, storm agitation, dredging and dredged-material disposal. Addition of fine silica sand to cultures of these common phytoplankton reduced their carbon assimilation by 50 to 90%, probably by light attenuation. Suspensions, in various concentrations, of Fuller's earth, fine silica sand, or natural sediments caused reductions in the copepod feeding rates. Concentrations greater than 250 mg/l caused reductions in the ingestion of labeled M. lutheri by the copepods. Evidently nonselective feeding exists at high particle densities in these zooplankton. The results of reduced consumption of food particles, if continued over a sufficiently long period, could cause a break in the food chain. However, these experiments cannot be used to predict the exposure time required to cause serious population depletion, as they were designed to measure feeding rates only. (Auen-Wisconsin)
W77-01784

WATER POLLUTION INVESTIGATION: GENESEE RIVER AND ROCHESTER AREA,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
P. E. Moffa, C. B. Murphy, and D. A. MacArthur.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 489, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-905/9-74-016, January 1975. 244 p. 53 fig., 25 tab., 86 ref., 3 append. 68-01-1574.

Descriptors: *Rivers, *Water pollution effects, *Water pollution sources, *Dissolved oxygen, *New York, River flow, Projections, Runoff, Computer programs, Chemical properties, Physical properties, Plankton, Fish, Benthos, Oxygen demand, Waste treatment, Industrial wastes, Municipal wastes, Lake Ontario, *Waste assimilative capacity, Model studies, Water quality standards, Water pollution control, Oxygen sag.
Identifiers: *Genesee River(NY), Rochester(NY).

Treatment extended beyond the secondary level for municipal discharges and Best Practicable Control Technology Currently Available for industrial discharges will not significantly improve the level of dissolved oxygen in the Genessee River, according to assimilation capacity modeling generated by a water quality study of pollution impacts on the river in Monroe County, New York at its point of entrance into Lake Ontario. Four major point discharges and three non-point sources have a significant effect on dissolved oxygen levels. Point sources are Oatka Creek, the Barge Canal, the Gates-Chili-Ogden sewage treatment plant and the Kodak Company wastewater treatment plant. These discharges are especially significant in relation to dissolved oxygen, carbonaceous and nitrogenous ultimate oxygen demand load, and minimum average seven consecutive day flow conditions. Non-point source effects on dissolved oxygen levels are contributions from cultivated and forested upstream areas of the drainage basin, benthic demand exerted in the lower six miles of the river, and horizontal dispersion effects in the river's lower reaches caused by the influence of Lake Ontario. (Harris-Wisconsin)
W77-01785

WATER POLLUTION INVESTIGATION: BUFFALO RIVER,
Versar, Inc., Springfield, Va. General Technologies Div.
D. H. Sargent.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 590, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-905/9-74-010, February 1975. 161 p. 13 fig., 41 tab., 66 ref., 6 append. 68-01-1569.

Descriptors: *Water pollution control, *Water pollution sources, *Rivers, *Great Lakes, *Projections, River flow, Flow rates, Water level fluctuations, Mixing, New York, Water quality standards, Tributaries, Sewage effluents, Pollutants, Industrial wastes, Mathematical models, Computer programs, Iron, Biochemical oxygen demand, Dissolved oxygen, Oxygen sag, *Waste assimilative capacity, Abiotic environment, Waste treatment.
Identifiers: *Buffalo River(NY), VERWAQ Computer program, Waste effluent standards, Cayuga Creek(NY), Niagara River(NY).

Present and projected waste loadings and water quality in the Buffalo River in western New York State were evaluated under terms of the 1972 United States-Canada Great Lakes Water Quality Agreement. Of 26 parameters studied, most showed evidence of poor water quality. In one parameter, the combination of low water velocities, high water temperatures and high waste loadings resulted in a summertime dissolved oxygen concentration of less than 1 mg/l and an almost complete absence of bottom organisms. The iron content levels were found to contravene accepted standards. Three independent observations confirmed that the industrialized section of the Buffalo River is a well-mixed body of water. Utilizing a water quality simulation model developed and verified in the study, projections were made for future water quality upon implementation of the Best Practicable Control Technology Currently Available, (BPCTCA). A post-BPCTCA projection showed that water quality standards would be marginally met for temperature and dissolved oxygen, but that more-stringent waste allocations would be needed for iron content. After BPCTCA, the dominant water quality achievement constraint in the river would be the oxygen-demanding waste load of the basin's combined sewer overflows. (Harris-Wisconsin)
W77-01786

NATIONAL EUTROPHICATION SURVEY METHODS 1973-1976.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
For primary bibliographic entry see Field 5A.
W77-01787

NATIONAL EUTROPHICATION SURVEY: DATA ACQUISITION AND LABORATORY ANALYSIS SYSTEM FOR LAKE SAMPLES,
Environmental Monitoring and Support Lab., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W77-01788

BENTHIC NUTRIENT REGENERATION AND ITS COUPLING TO PRIMARY PRODUCTIVITY IN COASTAL WATERS,
Woods Hole Oceanographic Institution, Mass.
G. T. Rowe, C. H. Clifford, and K. L. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-022 726, Price codes: A02 in paper copy, A01 in microfiche. Nature, Vol. 225, p. 215-217, May 15, 1975. (Report No. WHOI-76-25, March 1976. 5 p.) 2 fig., 1 tab., 19 ref. NR 083-004. N00014-66-C-0214; DES-74-22339.

Descriptors: *Cycling nutrients, *Nitrification, *Oceans, *Shallow water, *Primary productivity, Bottom sediments, Continental shelf, Nitrogen, Atlantic Ocean, New York, Benthos, Decomposing organic matter.
Identifiers: *New York Bight.

The high primary productivity of coastal ocean waters is attributed to nitrogen regeneration from continental shelf sediments. In situ measurements in the New York Bight of the rate at which ammonia and nitrate diffuse into the water column from sediments were based on the assumption that the breakdown of organic matter in sediments is proportional to the amount of oxygen required. Thus for each milliter of oxygen consumed, 0.4 mg organic carbon is oxidized to carbon dioxid Because the organic carbon-nitrogen ratio in se ments is about 10:1 or greater, it was constru that 0.041 mg organic nitrogen would be remine ized to ammonia for each milliliter of oxygen co sumed. Both the sediment oxygen demand and a monia production were highly dependent on te perature. Most of the nitrogen at warmer temper tures was in ammonia form, at lower temperatur nitrogen may be lost by denitrification to eleme tal nitrogen. When the bottome respiration on t continental shelf is approximately 10-20 ml/ m/hr 4.12 mg organic carbon and 0.412 mg orga nitrogen would be oxidized to carbon dioxide deaminated to ammonia. If about 80% of the a monia were released from the sediment t average feedback would be about 23.5 microgra atom nitrogen/sq m/hr. The high ammonia conce trations were not due to advection from offsh waters or from Hudson River effluent. (Au Wisconsin)
W77-01789

RELATIONSHIPS BETWEEN ZOOPLANKT DISPLACEMENT VOLUME, WET WEIGH DRY WEIGHT, AND CARBON,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W77-01790

A NOTE ON STANDING CROPS OF SPARTI ALTERNIFLORA IN TEXAS AND FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. Marine Science.
R. E. Turner, and J. G. Gosselink.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-248 3 Price codes: A03 in paper copy, A01 in microfic Marine Science, Vol. 19, p. 113-118, 1975. (Rep No. LSU SG-75-004). 2 fig., 3 tab., 18 ref. NO 04-5-158-12; DACW-39-73-C-0108.

Descriptors: *Aquatic plants, *Salt marsh *Standing crops, *Texas, *Florida, Productivi Gulf of Mexico, Estuarine environment
Identifiers: *Spartina alterniflora, Cord grass.

The productivity of cord grass (Spartina alt niflora) was measured at eight Gulf Coast si from Brownsville, Texas to Tampa, Florida. predicted biomass of live Spartina at the s sampled, average weight of individual matu young, and dead stems, and the live:dead ratio computed. The late summer biomass of material seems comparable to that on the E coast but it appears to decrease at the extreme its range. The influence of tidal amplitude discounted, but tidal energy is probably influen in physically fragmenting dead vegetation and low energy regime of the Gulf Coast would tially explain the greater proportion of material in these marshes relative to Georgia. weight of dead culms is only 50-75% of the we of mature live culms, an indication that 25-50% live organic weight is lost just before or soon a death, either by translocation to the roots, leaching, or by decomposition of the above gro material. Compared to the North Atlantic co biomass along the Gulf Coast increases more equal increments of height. The differences are tributable to variations in weight of indivi culms, in stem density at different sites, and in heavier per unit length of the culms. (A Wisconsin)
W77-01792

PRE-IMPOUNDMENT BIOLOGICAL SURV OF STOCKTON RESERVOIR-SAC RIVER, M SOURI, AUGUST 1968,
Federal Water Pollution Control Administrat Cincinnati, Ohio. Field Investigations Branch.
N. A. Thomas.
Available from the National Technical Infor tion Service, Springfield, VA 22161 as PB-245

Price codes: A02 in paper copy, A01 in microfiche. 1969. 9 p. 1 fig., 1 tab.

Descriptors: *Baseline studies, *Pre-impoundment, *Benthic fauna, *Missouri, Rivers, Varieties, Aquatic insects, Upstream, Downstream, Eutrophication.
Identifiers: *Sac River(Mo), Stockton Reservoir(Mo).

The populations inhabiting the headwaters of the Sac River were at least 50% pollution-sensitive stoneflies, mayflies and caddisflies. Slightly organically enriched Turkey Creek supported the largest populations (426 organisms/sq ft) of pollution-sensitive bottom animals but containing 27% sludgeworms. The reach of the Little Sac River that will be inundated supported 392 organisms/sq ft of benthic fauna comprising of 9% pollution-sensitive species. The number of bottom animals increased from 26 to 287 organism/sq ft and from 9 to 11 kinds in the 5-mile reach downstream from the Stockton Dam. Pollution-sensitive forms made up 39% and 52% of the population one-half mile and 5 miles downstream from the dam, respectively. Pollution-tolerant forms made up 46% and 42% of the populations respectively. Algal nuisances might develop in the reservoir because all the inflowing water contains in excess of 90 micrograms/l of total phosphorus. The inorganic nitrogen and total phosphorus concentrations in Little Sac River were 1.7 mg/l and 560 microgram/l, respectively. Downstream populations will probably improve as the result of higher water quality that will be discharged from the reservoir. (Auen-Wisconsin)
W77-01793

BIOLOGICAL INVESTIGATIONS OF TUTTLE CREEK RESERVOIR, KANSAS,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Field Investigations Branch.
J. A. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 782, Price codes: A02 in paper copy, A01 in microfiche. Report 1969. 18 p. 5 fig., 1 tab., 5 ref.

Descriptors: *Reservoirs, *Rivers, *Post-impoundment, *Benthic fauna, Physical properties, Chemical properties, *Kansas, Dissolved oxygen, Suspended solids, Light penetration, Euphotic zone, Primary productivity, Aquatic insects, Downstream, Upstream, Varieties.
Identifiers: *Big Blue River(Kan), Tuttle Creek Reservoir(Kan).

Surveys conducted in 1965, three years after inundation, and 1968 indicated that the productivity of the Big Blue River in Kansas had not increased as the results of impounding Tuttle Creek. The number of algae in Tuttle Creek Reservoir was always less than that observed upstream because of the restricted euphotic zone due to the 6,629,000 tons of sediments introduced annually and consequent turbidity. In the upstream reach of the reservoir primary production was measured at 310 and 800 mg C/cu m/day in 1966 and 1968, respectively; further downstream, primary production was reduced from 900 to 240 mg C/cu m/day. With the exception of winter, algal counts were low because of reduced light penetration and adherence of silt to algal cells causing their premature settling. Phosphorus concentrations decreased as the water passed through the reservoir; 80% of the phosphorus in the reservoir was in soluble form, indicating that there was little phosphorus utilization by algae. Both species diversity and numbers of bottom organisms increased upstream after impoundment, with 80% typical of clean water. A desirable population of benthic fauna had not developed downstream in the Big Blue River because of an inadequate food supply, excess siltation, and decreases in water velocity. Benthic fauna in the reservoir had also declined. (Auen-Wisconsin)
W77-01794

SUSPENDED SEDIMENT DETERMINATION IN ESTUARINE WATERS FROM PHOTOMETER AND SECCHI DISC MEASUREMENTS,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 5A.
W77-01795

LIMNOLOGICAL STUDIES OF FLATHEAD LAKE, MONTANA: A STATUS REPORT,
Montana Univ., Missoula. Dept. of Biology.
A. R. Gaufin, G. W. Prescott, and J. F. Tibbs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 445, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/3-76-039, April 1976. 92 p, 6 fig, 18 tab, 75 ref, 1 append. 1-F1-WP-26, 212-1-4.

Descriptors: *Limnology, *Oligotrophy, Montana, Algae, Cyanophyta, Diatoms, *Montana, Chlorophyta, Chrysophyta, Pyrrophyta, Euglenophyta, Dominant organisms, Limiting factors, Varieties, Physical properties, Chemical properties, Water temperature, Aquatic weeds, Rotifers, Zooplankton, Daphnia, Temporal distribution, Spatial distribution, Trout, Rotifers, Copepods, Salmon, Crustaceans, Fish populations.
Identifiers: *Flathead Lake(Mont), Bacillariophyceae, Xanthophyceae, Cryptophyta, whitefish.

Flathead Lake is a dimictic oligotrophic lake. The algal flora is classified as a Diatom-Cyanophyte moderately hardwater type and contains 102 Chlorophyta species, 40 Cyanophyta species, 12 Chrysophyceae species, 399 Bacillariophyceae species and varieties in 42 genera, 13 Pyrrophyta species, 4 Xanthophyceae species, 1 Euglenophyta species, and 2 Cryptophyta species. Nitrate and phosphate concentrations are relatively low but are occasionally high enough to support blue-green algal blooms, indicating gradual eutrophication in restricted areas. Low temperatures and low concentrations of organic acids and vitamins are deterrents to extensive blooms. The more common forms of zooplankton found are Daphnia species, Kellicottia longispina, Keratella cochlearis, Cyclops bicuspidatus thomasi, and Diaptomus ashlandi. Spatial and temporal distribution of Daphnia appears to be influenced primarily by temperature. A total of 8,912 fish were collected between November 1967-December 1971 consisting of 15 major species: lake whitefish, Kokanee salmon, Dolly Varden, and Lake trout were the most common game species. The future of the Flathead Lake fishery depends on natural reproduction in its waters and the quality of the aquatic habitat. Water development projects, housing projects, lumbering, and natural environmental variations will all be reflected in fish populations of this drainage system. (Buchanan-Davidson--Wisconsin)
W77-01796

DEGRADATION OF PESTICIDES BY ALGAE,
Alabama Univ., University. Dept. of Biology.
J. C. O'Kelley, and T. R. Deason.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 933, Price Codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-76-022, March 1976. 48 p. 13 tab., 48 ref. R-800371.

Descriptors: *Biodegradation, *Pesticides, *Algae, Sorption, Phytotoxicity, *Alabama, Diazinon, Dieldrin, Pesticide toxicity, Endrin, Heptachlor, Inhibitors, Pesticide residues.
Identifiers: *Black Warrior River(Ala), Atrazine, Methoxychlor, 2.4-DBE, Carbaryl, Malathion, Captan, Toxaphene.

Interactions of twelve pesticides with 37 fresh water algae collected from the Black Warrior River, Alabama, were studied to determine variability in algal responses to pesticides. Sensitivity to pesticides varied with different algae, thus estimates of environmental damage to fresh water flora can be erroneous if based on laboratory strains. Algae used should be representative of algae native to particular aquatic environments. Atrazine was the most toxic to the river algae; some more sensitive than previously reported. Sorption of methoxyclor, 2,4-dichlorophenoxyacetic acid, butoxy ethyl ester (2,4-DBE), and carbaryl varied with different species. C14-methoxychlor adsorbed by algae was rapidly exchanged with unlabeled methoxychlor, indicating that uptake was largely due to physical adsorption to cell surfaces. Some algal strains lack binding sites for 2,4-DBE thus sorption is undetectable. The long lag in C14-carbaryl uptake by some algae suggested that breakdown products, not the parent pesticides, were adsorbed. It is stressed that generalizations about pesticide uptake by algae may cause errors in estimating environmental effects of such uptake. Biological breakdown of malathion by algae can occur in light. Some algae can degrade methoxychlor and 2,4-DBE even if not absorbed. (Buchanan-Davidson--Wisconsin)
W77-01797

CHLOROPHYLL-A AND PRIMARY PRODUCTION IN GEORGIAN BAY, NORTH CHANNEL, AND LAKE HURON, APR. TO DEC. 1974,
Canada Centre for Inland Waters, Burlington (Ontario).
N. H. F. Watson, L. R. Culp, and H. F. Nicholson.
Canada Fisheries and Marine Service Technical Report No. 600, 1976. 47 p. 18 fig., 6 tab., 10 ref.

Descriptors: *Primary productivity, *Chlorophyll, *Lake Huron, Carbon, Photosynthesis, Trophic level, Carbon radioisotopes, *Canada, Lakes, Great Lakes, *Oligotrophy, *Mesotrophy.
Identifiers: Georgian Bay(Lake Huron), North Channel(Lake Huron).

The trophic status of Georgian Bay is between that of Lake Superior on the oligotrophic end of the scale and Lake Huron and North Channel at the mesotrophic end, according to comparative computations made from chlorophyll-a and carbon-14 uptake measurements made during seven cruises in Georgian Bay, North Channel and the northernmost portion of Lake Huron during 1974. Annual primary production estimates were computed from the chlorophyll-a and carbon uptake measurements and a trophic range was established on the basis of comparisons made with other recent studies. In Georgian Bay, cruise means of corrected chlorophyll-a ranged from 0.7 micrograms/l to 1.7 micrograms/l. The range in North Channel was 1.3 micrograms/l to 2.3 micrograms/l and in Lake Huron, 1.0 micrograms/l to 2.3 micrograms/l. Annual primary productivity for Georgian Bay was estimated at 76 grams C/sq m/yr, using the mean uncorrected chlorophyll-a value, and 35 grams C/sq m/yr, using carbon-14 cruise means extended to zero winter values. For North Channel, the respective estimates were 92 grams C/sq m/yr and 37 grams C/sq m/yr; the Lake Huron estimate from uncorrected chlorophyll-a value alone was 92 grams C/sq m/yr. (Harris-Wisconsin)
W77-01798

SEASONAL ABUNDANCE AND HORIZONTAL DISTRIBUTION OF PLANKTONIC CRUSTEACEA OF GEORGIAN BAY,
Canada Centre for Inland Waters, Burlington (Ontario).
J. Carter.
Canada Fisheries and Marine Service Technical Report No. 588, 1975. 27 p. 9 fig., 3 tab., 4 ref.

Descriptors: *Plankton, *Crustaceans, *Biological communities, Population, Dominant organisms, *Phosphorus, *Lake Huron, Copepods, *Canada, Distribution, *Temporal distribution, *Spatial distribution, Varieties, *Chlorophyll, *Eutrophication.

Identifiers: Cyclops bicuspidatus thomasi, Georgian Bay(Lake Huron), North Channel(Lake Huron).

A study of the density of planktonic crustacea and of the relationship between crustacean density, phosphorus loading and surface chlorophyll-a indicates that the eutrophication level for Georgian Bay is lower than that of Lake Huron but slightly higher than for Lake Superior. Samples were periodically collected May-December 1974 at 46 stations in Georgian Bay and North Channel. Species composition, abundance and seasonal and horizontal distribution were analyzed. Eleven cladocerans and 12 copepods were identified; among the latter, Cyclops bicuspidatus thomasi comprised more than 50% of all planktonic crustacea. Abundance of cladocera, cyclopoid copepods and calanoid copepods was greatest in midsummer, with a secondary copepod peak in December. Patalas observed (1972) that planktonic crustacea density in the Great Lakes is positively related to lake-average chlorophyll-a concentrations, which is in turn positively related to the total annual phosphorus loading for each lake. Taking into account horizontal distribution variances for the planktonic crustacea, and considering the isolation of Georgian Bay and North Channel from Lake Michigan outflows, comparisons can be made with animal concentrations previously found by Patalas in Lake Superior and Lake Huron. (Harris-Wisconsin)
W77-01799

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF GEORGIAN BAY AND NORTH CHANNEL,
Canada Centre for Inland Waters, Burlington (Ontario).
C. C. Loveridge, and D. G. Cook.
Canada Fisheries and Marine Service Technical Report No. 610, 1976. 53 p. 18 fig., 8 tab., 13 ref., 6 append.

Descriptors: *Lake Huron, *Benthic fauna, *Dominant organisms, Oligochaetes, Invertebrates, Distribution patterns, Lake sediments, Ecological distribution, Nematodes, Biological communities, Standing crops, Diptera, Biomass, *Canada.
Identifiers: *Georgian Bay(Lake Huron), *North Channel(Lake Huron), Pontoporeia affinis, Sphaeriids.

Three major trends are indicated from a benthological investigation of Georgian Bay and North Channel of Lake Huron. (1) Benthic populations in both bodies of water are greater in zones closest to the northern and northwestern shores; (2) macroinvertebratic abundance increases positively with reduced depth in these waters; and (3) faunal abundance is greater in coarse-grained sediments than in fine-grained ones. Benthos samples were collected during September 1973 from 111 of 121 stations in Georgian Bay and from 53 of 55 stations in North Channel. Findings in Georgian Bay included 51% Pontoporeia affinis, 20% Nematoda, 13% Sphaeriidae, 12% Oligochaeta and 3% Chironomidae. In North Channel the percentages for these fauna were 48% P. affinis, 18% Sphaeriidae, 15% Nematoda, 11% Oligochaeta, and 2% Chironomidae, with 6% miscellaneous taxa. Mean biomass was computed at .542 g/sq m in North Channel and .367 g/sq m in Georgian Bay. Little significant difference was found in the biomass composition percentages for all the important benthic macroinvertebrates in the two bodies of water. (Harris-Wisconsin)
W77-01800

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
D. G. Cook.
Canada Fisheries and Marine Service Technical Report No. 572, 1975. 52 p, 11 fig., 2 tab., 26 ref., 2 append.

Descriptors: *Lake Superior, *Ecological distribution, *Benthic fauna, Oligochaetes, Diptera, Invertebrates, Distribution patterns, Lake sediments, Nematodes, Dominant organisms, Standing crops, Biomass, Benthos.
Identifiers: Pontoporeia affinis, Sphaeriids.

Possible ecological danger from mining activities on the northwest shore of Lake Superior is implied at the extreme western basin of the lake, based on a paucity of fauna found there during a lake-wide benthological investigation in April-May 1973. Four major trends were found: (1) benthic populations were greatest in the eastern lake waters, with relatively high density in Whitefish Bay; (2) benthic abundance generally correlated negatively with depth; (3) faunal abundance was correlated negatively with sedimentary organic carbon content; and (4) greater abundance of fauna was found in coarse-grained sediments than in fine-grained ones. A lake-wide estimate of the total macrobenthos in Lake Superior, based on a uniform grid pattern of about 400 stations, is 525/sq m, composed of 34% Pontoporeia affinis, 26% Oligochaeta, 32% Nematoda, 6% Sphaeriidae and 3% Chironomidae. Most of the Oligochaeta are Stylodrilus heringianus and Mesechytraeus. Nine major regions of Lake Superior were differentiated, with zones drawn to minimize population size and composition variation. (Harris-Wisconsin)
W77-01801

ALGAL ASSAYS: DEVELOPMENT AND APPLICATION,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
T. E. Maloney, and W. E. Miller.
American Society for Testing and Materials Special Technical Publication 573, p. 344-355, 1975. 8 fig., 2 tab., 5 ref.

Descriptors: *Bioassay, *Water analysis, *Algae, Testing procedures, Laboratory tests, Eutrophication, Nitrilotriacetic acid, Nutrients, *Pollutant identification, *Analytical techniques.
Identifiers: Bottle test, Chemostat test.

Descriptions are given of the development of algal assays in evaluating eutrophication. Testing methods and results of various laboratory algal assays are reviewed. The influence of nitrilotriacetic acid (NTA) on eutrophication was evaluated, with results indicating that NTA has no stimulatory effect on algal growth. Uses of assays are shown in their application to determination of algal growth-limiting nutrients, measurement of nutrient status and algal sensitivity to nutrient changes, to the evaluation of effects of changes in waste treatment processes on receiving waters, and to the assessment of materials and products to determine their potential effects on algal growth. Three fundamentally-different kinds of procedures are reviewed, analyzed and compared: the static bottle test, the continuous-flow chemostat test and the in-situ test. Data is given on the chemical content of various bodies of fresh water, along with data on algal growth stimulation achieved by restoring phosphorus to tertiary waste water. (Harris-Wisconsin)
W77-01803

1975 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Northern Ireland Dept. of Agricultural, Antrim. (1975). 19 p. 7 fig., 6 tab.

Descriptors: *Eutrophication, *Runoff, Europe, Urban runoff, Forest management, Agricultural runoff, Zooplankton, *Bioassay, Feed lots, Farm wastes, Oxygen sag, Phosphorus compounds, Nitrogen compounds, Trace elements, *Pollutant identification.
Identifiers: *Lough Neagh(N Ireland).

The use of algal isolates for bioassay work identify limiting factors in the growth of alga lead to a preliminary observation that algal grow in mountain lakes and reservoirs is not limited the availability of trace metals, is among t results of studies ongoing since 1968 on alg blooms in Lough Neagh and other freshwat bodies in Northern Ireland. Results of certain st dies indicate that phosphorus is a critical nutrie and that it limits the production of algae in t lake. Regression analysis of areal loadings nitrogen and phosphorus from rivers that fe Lough Neagh indicates a significant correlati between soluble ortho-P loadings and the hum population density of the basin catchments. Ho ever, particulate-P and nitrogen loadings do n correlate with human population density. Oth research conducted by the Freshwater Biologic Investigation unit included surveys of fa streams in which point-source pollution w identified, and an investigation of water loadin in a residential district. (Harris-Wisconsin)
W77-01804

CHEMISTRY OF NEARSHORE SURFICIA SEDIMENTS FROM SOUTHEASTERN LAK MICHIGAN,
Michigan Univ., Ann Arbor. Great Lak Research Div.
R. Rossmann.
Special Report No. 57. 1975. 67 p. 45 fig., 6 tab., ref., 3 append.

Descriptors: *Lake sediments, *Lake Michiga *Metals, *Chemical properties, *Mineralog Nuclear powerplants, Silicates, Carbonates, O ganic matter, Iron, Distribution, Calcium, Carbo Cobalt, Chromium, Copper, Potassium, Magne um, Manganese, Molybdenum, Nickel, Sodiu Phosphorus, Strontium, Zinc, Oxidation reducti potential, Hydrogen ion concentration, Tribut ries, *Michigan, Littoral, Barium.

Three small streams discharging into La Michigan south of the Donald C. Cook nucle plant near St. Joseph, Michigan have profound increased surficial sediment concentrations of n merous carbonates and other chemical co pounds, according to an analysis of sediment sa ples collected offshore of the facility. A furth conclusion is that construction of the plant's i takes and discharges may have altered the surfici sediment chemistry offshore of the plant. A colle tion was made of 158 sediment samples wh were analyzed for 22 variables; including insol bility, loss on ignition, and measurements of va ous carbons, and other minerals. According areal distribution maps, correlation coefficien and factor analysis, the carbonates are the dom nant compound and control the chemistry of t sediments. But iron and organic compounds a the most chemically-active components capable adsorption, desorption, precipitation and oth trace metal concentration processes. Effects the stream discharge into the lake near the plant traceable through such variables as carbon, o ganic carbon and phosphorus. A suggestion ca for any monitoring of sediments for the impact plant discharges to be done in areas of high iro manganese, organic carbon or clay mineral co tent, where accumulation and concentration radioactive isotopes to be released to the lake the plant are considered most likely. (Harr Wisconsin)
W77-01805

THE DEMONSTRATION AND STANDARDIZ TION OF A METHOD FOR MONITORING TH ECOLOGICAL EFFECTS OF MARINE WAST DISCHARGES.
Biome Co., Inc., Surfside, Calif.
For primary bibliographic entry see Field 5A.
W77-01806

VATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA--LAKE ERIE. VOL. II THE FISHES OF THE CLEVELAND METROPOLITAN AREA INCLUDING THE AKE ERIE SHORELINE,
ohn Carroll Univ., Cleveland, Ohio. Dept. of iology.
. M. White, M. B. Trautman, E. J. Foell, M. P. Kelty, and R. Gaby.
Available from the National Technical Informaon Service, Springfield, VA 22161 as PB-242 747, rice Codes: A09 in paper copy, A01 in icrofiche. Report No. EPA-905/9-75-001, ebruary 1975. 193 p. 43 fig., 12 tab., 163 ref. EPA 005107.

escriptors: *Water quality, *Lake Erie, *Fish opulations, *Baseline studies, Habitat improveent, Water pollution, Varieties, History, Fish onservation, Rivers, Silting, Spawning, Fish igration, Dams, Dredging, Fish reproduction, ittoral, Economic impact, Rough fish, Erosion ontrol, *Ohio.
dentifiers: *Cleveland(Ohio), Chagrin iver(Ohio), Cuyahoga River(Ohio), Rocky iver(Ohio), Fish species diversity.

ake Erie fish populations close to the Cleveland etropolitan Area are under stress from the egradation of the ecosystem and the stress varies gnificantly within the study area. The most ghly distressed area is the lower 7 miles of the uyahoga River. All fish fauna in the nearshore aters of Lake Erie and the Three Rivers atershed were investigated in 1971-74. The 86 ecies now inhabiting the waters are markedly fferent from the 107 species in the same waters earlier time periods. Species changes and fish opulation declines are attributed to stream obruction, pollution, siltation, loss of aquatic getation and other causes. The species composion has changed from one of highly-valuable food ecies and clean-water forms--such as muskelnge, walleye and lake trout--to a predominance low food value species such as goldfish, carp, llow perch and gizzard shad. The decline is ceable to a historical sequence dating back at st to 1840. The recovery of most of the species abundant levels is possible through recomended pollution abatement and habitat restoran measures. (Harris-Wisconsin)
77-01807

TERIC VIRUS SURVIVAL IN PACKAGE ANTS AND THE UPGRADING OF THE MALL TREATMENT PLANTS USING OZONE,
ntucky Water Resources Research Inst., Lexton.
r primary bibliographic entry see Field 5D.
77-01809

LUTION FOR EUTROPHICATION CONOL IN MOSES LAKE: HYDRAULIC MODEL UDY,
shington Univ., Seattle. Dept. of Civil Eneering.
r primary bibliographic entry see Field 5G.
77-01814

-LINE SURVEILLANCE OF INDUSTRIAL FLUENTS EMPLOYING CHEMICAL-PHYSIL METHODS OF FISH AS SENSORS,
nnessee Technological Univ., Cookeville. Dept. Civil Engineering.
r primary bibliographic entry see Field 5A.
7-01823

CREATIONAL REUSE OF MUNCIPAL STEWATER -- PHASE II,
xas Tech Univ., Lubbock. Water Resources nter.
r primary bibliographic entry see Field 5D.
7-01824

ABUNDANCE AND SEASONAL DISTRIBUTION OF MARINE MAMMALS IN THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01827

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY IN THE NORTHEAST GULF OF ALASKA,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-01849

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01855

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01857

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BERING SEA AND GULF OF ALASKA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01858

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BEAUFORT SEA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01859

LITERATURE SEARCH ON THE DENSITY AND DISTRIBUTION OF FISHES OF THE BEAUFORT SEA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01860

ALASKA MARINE ICHTHYOPLANKTON KEY,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01861

LITTORAL SURVEY OF THE BEAUFORT SEA,
Western Washington State Coll. Bellingham.
For primary bibliographic entry see Field 6G.
W77-01862

BEAUFORT SEA PLANKTON STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01863

THE PHYSIOLOGICAL EFFECT OF ACUTE AND CHRONIC EXPOSURE TO HYDROCARBONS OF PETROLEUM ON THE NEAR-SHORE FISHES OF THE BERING SEA,
Scripps Institution of Oceanography, La Jolla, Calif.
A. L. De Vries.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 1-14, April 1976. 1 fig, 5 tab, 6 ref. 03-5-022-86.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold region, *Toxicity, *Oil pollution, *Physiological ecology, Continental Shelf, Alaska, Aromatic compounds, Antifreeze, Sculpins.
Identifiers: *Outer Continental Shelf, *Petroleum resources, *Oil exploration, *Oil development, *Aromatic hydrocarbons, *Crude oils, Bering Sea, Hydrocarbons, Near shore fishes, Naphthalenes, Cod, Flounders, Liopsetta, Eleginus, Myoxocephalus, Megalocottus, *Protein synthesis.

Toxicity data for exposure to water soluble hydrocarbons on a few Bering Sea fishes are presented. The temperature of exposure appears to have profound effect. At low temperatures the hydrocarbons appear to be less toxic. Baseline measurements of oxygen consumption both at the organismal and tissue level reveal that the Bering Sea fishes are similar to other cold water fishes in regards to their physiology. Studies of the levels of freezing resistance in sculpin indicated that it is a seasonal phenomonen. The time course of the appearance and disappearance of freezing resistance indicate that this system will be a good model for studying the effect of naphthalene on antifreeze synthesis. (Sinha-OEIS)
W77-01864

PHYSIOLOGICAL IMPACT OF OIL ON PINNIPEDS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. Gentry, and W. B. McAlister.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 15-23, April 1976. 1 tab, 3 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, *Oil spills, Physiological ecology, Otters, Mammals, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Pinnipeds, Sea otters, Oil exploration, Oil development, Petroleum resources.

Laboratory physiological measurements (metabolic rates and heat flux) are applied to the field problem of pinnipeds and otters encountering an oil spill. Direct measurements of diving behavior in unrestrained animals at sea are also made. The rationale for these two approaches is that for fur bearers oil fouling is likely to directly effect the insulative properties of the fur which will result in altered metabolic costs and impaired diving performance. In non-fur bearers different effects are anticipated. (Sinha-OEIS)
W77-01865

ACUTE AND CHRONIC TOXICITY, UPTAKE AND DEPURATION, AND SUBLETHAL METABOLIC RESPONSE OF ALASKAN MARINE ORGANISMS TO PETROLEUM HYDROCARBONS,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Service, Seattle, Washington. Northwest Fisheries Center.
S. D. Rice, and J. F. Karinen.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 25-47, April 1976. 3 tab.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, *Oil spills, *Metabolism, *Toxicity, Continental Shelf, Alaska, Bioassays, Aquatic animals.

Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, Crude oils, Oil exploration, Oil development, Petroleum resources.

This study was designed to determine the acute and chronic toxicity of crude oil and its component fractions on physiological and behavioral mechanisms of selected arctic and subarctic organisms and to determine recovery rates of selected organisms in laboratory and field studies. Temperature has little effect on toxicity, so that data generated at 12 deg. C can be extrapolated to colder climates. Oil exposures stimulate metabolism in fish, rather than depress metabolism, as in crabs. (Sinha-OEIS)
W77-01866

RESPONSE OF THE CLAM, MACOMA BALTHICA (LINNAEUS), ESPOSED TO PRUDHOE BAY CRUDE OIL AS UNMIXED OIL, WATER-SOLUBLE FRACTION, AND SEDIMENT-ADSORBED FRACTION IN THE LABORATORY,
National Marine Fisheries Services, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Services, Seattle, Washington. Northwest Fisheries Center.
T. L. Taylor, J. F. Karinen, and H. M. Feder.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 48-87, April 1976. 8 fig, 10 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, *Oil spills, *Clams, *Continental Shelf, Alaska, Coasts, Transportation, Sedimentation.
Identifiers: *Outer Continental Shelf, *Intertidal mudflats, *Crude oils, Naphthalene, Tankers, Macoma balthica, Oil exploration, Oil development, Petroleum resources.

The small clam, Macoma balthica (Linnaeus, 1758), occurs throughout the coastal area of Alaska in the upper 4-8 cm of intertidal mudflats. Because it is both a deposit and suspension feeder, M. balthica is potentially susceptible to oil slicks layered on the mud and to water-soluble or sediment-adsorbed fractions of crude oil. Oil adsorbed on sediment and allowed to settle over buried M. balthica stimulated movement to the surface. The proportion of clams that moved to the surface increased as the depth of oil-contaminated sediment increased. In tests many of the clams recovered from exposure, but in nature they might have fallen to predators or adverse environmental conditions. Data on the response of M. balthica to oil can be used in the evaluation of the organism as an indicator of the effect of oil in the sediment environment. (Sinha-OEIS)
W77-01867

EFFECT OF PETROLEUM HYDROCARBONS ON BREATHING AND COUGHING RATES, AND HYDROCARBON UPTAKE-DEPURATION IN PINK SALMON FRY,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
S. D. Rice, R. E. Thomas, and J. W. Short.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 88-118, April 1976. 6 fig, 1 tab, 19 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, *Oil spills, *Toxicity, *Salmon, Alaska, Continental Shelf, Aromatic compounds, Survival.
Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, *Pink salmon fry, *Crude oils, Oncorhynchus gorbuscha, Oil exploration, Oil development, Petroleum resources.

Pink salmon fry, Oncorhynchus gorbuscha, were exposed to the water-soluble fraction of Cook Inlet and Prudhoe Bay crude oils, and No. 2 fuel oil. During 22 h exposures, breathing and coughing rates initially increased as the dose increased but then decreased after several hours. Breathing and coughing rates increased significantly during exposures to oil concentrations as low as 30% of the 96 h median tolerance limit as determined by ultraviolet spectroscopy. It is speculated that the increased respiration rate reflects an increased energy demand for enzyme synthesis. Chronic exposure requiring elevated energy demands may be detrimental to the survival of a population. (Sinha-OEIS)
W77-01868

SUBLETHAL EFFECTS AS REFLECTED BY MORPHOLOGICAL, CHEMICAL, PHYSIOLOGICAL AND BEHAVIORAL INDICES,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
D. C. Malins, H. O. Hodgins, and D. D. Weber.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 119-138, April 1976. 14 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, Aquatic animals, Trout, Salmon, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, *Trace metals, Crude oils, Cell biology, Protein synthesis, Oncorhynchus kisutch, Parophrys vetulus, Oil development, Oil exploration.

Preliminary experiments in cell biology indicated that the liver of trout (Salmo gairdneri) is a primary site of alteration in biochemical activity when the fish ingest crude oil. The liver showed two major changes: a depletion of energy storage products, glycogen and lipid, and an increase in the endoplasmic reticulum, a component of cells that is instrumental in protein synthesis. When coho salmon, (Oncorhynchus kisutch) and English sole (Paraphrys vetulus) were immersed in a sublethal concentration of water-soluble fraction of crude oil there appeared to be a depletion of mucus from the producing cells at the skin surface. These cellular changes are considered to be symptomatic of deleterious effects of petroleum oil on all three species of fish. In contrast, in related experiments, the feeding of intentionally high levels (one part/1000 oil in food) of crude oil to sexually maturing trout for six months did not result in mortality or grossly detectable damage prior to spawning; nor did it appear to impair the viability of their eggs and sperm. (Sinha-OEIS)
W77-01869

IDENTIFICATION OF MAJOR PROCESSES IN BIOTRANSFORMATIONS OF PETROLEUM HYDROCARBONS AND TRACE METALS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
D. C. Malins, W. L. Reichert, and W. T. Roubal.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 139-153, April 1976. 3 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, Aquatic animals, *Salmon, *Shrimp, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, *Trace metals, Flatfish, Arctic environments, Subarctic environments, Oil exploration, Oil development, Petroleum resources.

The objectives of this research unit were th identification and evaluation of certain physiologi cal and biological effects of petroleum hydrocar bons on salmon, flatfish, and spotted shrimp an their larvae. Also included were studies on the ef fects of trace metals on salmon and flatfish. Th effects of petroleum hydrocarbons were evaluate in terms of uptake and depuration studies in whic hydrocarbons were administered by diet as well a by exposure to water-soluble fractions via immer sion. In both the hydrocarbon and trace metal stu dies, chemical and physiological parameters wi be correlated with data obtained by microscopi techniques. To date, emphasis of this research un has been largely on the establishment and stan dardization of experimental techniques an protocols. (Sinha-OEIS)
W77-01870

ASSESSMENT OF AVAILABLE LITERATUR ON EFFECTS OF OIL POLLUTION ON BIOT IN ARCTIC AND SUBARCTIC WATERS,
National Marine Fisheries Service, Seattle, Wash Northwest Fisheries Center.
D. C. Malins, and M. E. Stansby.
In: Environmental Assessment of the Alaska Continental Shelf. Principal Investigators' Report for the Year Ending March 1976, Vol 8. Effects o Contaminants, p 155-320, April 1976.

Descriptors: *Environmental effects, *Resource development, *Water pollution effects, *Baselin studies, *Cold regions, *Oil pollution *Bibliographies, *Biota, Continental Shel Alaska.
Identifiers: *Outer Continental Shelf, Oil develo ment, Oil exploration, Petroleum resource Petroleum hydrocarbons.

Literature is being reviewed backwards from th present time to as far back as anything can b found. While a few references are found datin back as much as 50 years, a preponderance of th material has been published during the last f years, much of it during the past three or fo years. This information is being developed both the form of extensive bibliographic reference list tabulated under 20 subject headings, and b preparation of a series of critical reviews prepare by scientific specialists from the information ga ined from available reports compiled in th bibliography. Included in this report is a listing references in rough draft form of over 150 page (Sinha-OEIS)
W77-01871

ACUTE EFFECTS - PACIFIC HERRING ROE I THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Smith, J. G. Pearson, and J. A. Cameron.
In: Environmental Assessment of the Alaska Continental Shelf. Principal Investigators' Repor for the Year Ending March 1976, Vol 8. Effects Contaminants, p 325-343, April 1976. 34 ref. 03-022-56.

Descriptors: *Environmental effects, *Resourc development, *Water pollution effects, *Baselin studies, *Cold regions, *Oil pollution, *Herring Alaska, Continental Shelf, Intertidal areas, Fish ries, Mortality, Fish larvae, Seepage.
Identifiers: *Outer Continental Shelf, Pacific he ring roe, Gulf of Alaska, Crude oils, Clupea p lasii, Oil development, Oil exploration, Petroleu resources.

The objective of this study is to delineate the to icity of soluble components of crude oil und simulated natural conditions. Toxicity is measur in terms of hatching success and gross morphol ical abnormalities. Herring spawn in a habi which is particularly susceptible to the influen of crude oil. Many of the roe are deposited in t intertidal, the larger usually being deposit highest on the beach. Since the larger eggs n mally produce the larvae with the greatest chan

reaching adulthood, the presence of oil on the
ıter and on the beach will select agains the
ghest quality of eggs in particular and will cause
increased mortality in general. Spills or seepage
ring the three to four week reproductive period
uld have significant impact on egg and larval
rtality. These mortality rates are already high in
ture. Development activities could have a major
pact on the herring fishery in Alaska. (Sinha-
IS)
7-01872

**TUTE AND CHRONIC TOXICITY OF SEA-
ATER EXTRACTS OF ALASKAN CRUDE OIL
ZOEAE OF THE DUNGENESS CRAB,
NCER MAGISTER DANA,**
egon State Univ., Newport. Marine Science
nter.
S. Caldwell.
Environmental Assessment of the Alaskan
ntinental Shelf. Principal Investigators' Reports
the Year Ending March 1976, Vol 8. Effects of
ntaminants, p 345-375, April 1976. 14 fig, 1 tab,
ef. 03-5-022-68.

scriptors: *Environmental effects, *Resources
elopment, *Water pollution effects, *Baseline
dies, *Cold regions, *Oil pollution, *Toxicity,
ska, Continental Shelf, Crabs, Aromatic com-
nds.
ntifiers: *Outer Continental Shelf, Dungeness
bs, Cancer magister, Zoeae, Benzene,
phthalene, *Crude oils, Oil exploration, Oil
elopment, Petroleum resources.

full strength seawater soluble fraction of
ok Inlet crude oil is acutely toxic to first instar
nagister larvae but no lethalor sublethal effects
e found of an approximately 1/10 dilution of
fraction during a 28-day continuous exposure
od. In similar long-term exposures, 0.16 ppm
hthalene, the highest concentration tested, is
without effect on the larvae but 7.2 ppm
zene and possibly also 1.4 ppm benzene result
educed larval survival. The effects of benzene
ear to be manifested at the time of the first
al molt in these longterm exposures. A com-
son of the lethal concentration of benzene with
estimated concentration of this aromatic com-
nd in the full strength seawater soluble fraction
rude oil suggests that benzene may account for
ajor portion of the toxicity of this fraction.
e the concentrations of many of the seawater
actable components of crude oil may be ex-
ed to decline rapidly under natural environ-
tal conditions as a result of dilution, evapora-
, and metabolism by microorganisms, these
ies suggest that crude oil contaminations of
vater may not seriously affect decapod larvae
ng as the larvae do not contact the oil/water
face. (Sinha-OEIS)
-01873

**LETHAL EFFECTS - EFFECTS ON SEA
ASS,**
ka Univ., College. Inst. of Marine Science.
Pearson.
Environmental Assessment of the Alaskan
tinental Shelf. Principal Investigators' Reports
he Year Ending March 1976, Vol 8. Effects of
taminants, p 377-389, April 1976. 1 fig. 03-5-
56.

criptors: *Environmental effects, *Resources
lopment, *Water pollution effects, *Baseline
es, *Cold regions, *Oil pollution, *Toxicity,
nary productivity, *Aquatic plants, *Food
ıs, Continental Shelf, Alaska, Grasses, Ice
r, Photosynthesis.
ifiers: *Outer Continental Shelf, *Sea grass,
roleum hydrocarbons, Zostera marina, Oil ex-
tion, Oil development, Petroleum resources.

study is directed at evaluating the effects of
ted petroleum hydrocarbons (dodecane,
ne, and napthalene) on rates of photosynthes-
is in Zostera marina. Since Z. marina is a major contributor to primary production in many ecological niches along the Alaskan coastline, it is imperative to understand what possible effects of plant exposure to low-levels of the more water soluble and toxic components of petroleum. Deleterious effects on sea-grass could disrupt whole food chains. (Sinha-OEIS)
W77-01874

EVALUATION STRATEGIES OF METAL POLLUTION IN OCEANS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W77-01875

CHANGES IN BIOCENOSES OF PLANKTONIC ORGANISMS UNDER CONDITIONS OF A SEMI-CLOSED PRODUCTION COOLING SYSTEM AND A WATER PURIFICATION SYSTEM, (IN RUSSIAN),
Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany.
K. K. Yankyavichyus, A. Y. Baranauskene, V. Y. Gribauskene, D. P. Kitrene, and B. A. Malamene.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai 1, p 13-20, 1975.

Descriptors: *Water purification, Plankton, *Zooplankton, *Cooling water, *Algae, Microorganisms, *Bacteria, Organic matter, Ions.
Identifiers: *Biocenoses, Deionized water.

Investigation in 1971-1972 of semi-closed production cooling system water (N production) and water of a high purification degree system (electronic industry) showed the river water to be polluted with organic substances in the semi-closed system. Removal of the organic substances caused development of algae and heterotrophic planktonic organisms (zoo-and bacterioplankton). In the high purification degree system the microorganisms increased in ionic (anions and cations) resins; the highest numbers of microorganisms (168,000 - 3 million cells/ml) and their metabolities (hydrolytic ferments) were detected in deionized water.--Copyright 1976, Biological Abstracts, Inc.
W77-01876

DISEASE RISKS OF OCCUPATIONAL EXPOSURE TO SEWAGE,
Cincinnati Univ., Ohio. Environmental Health Engineering.
C. S. Clark, E. J. Cleary, G. M. Schiff, C. C. Linnemann, Jr., and J. P. Phair.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE2, p 375-388, Proceedings paper No. 12038, April 1976. 3 tab, 61 ref.

Descriptors: *Sewage bacteria, *Environmental engineering, *Diseases, *Epidemiology, Shigella, Waste water(Pollution), Treatment facilities, Risks, Water pollution effects, Public health, Parasites.
Identifiers: *Gastrointestinal diseases, *Health hazards, *Viral diseases, *Serology, *Infectious hepatitis, Antibodies, Leptospira, Parasitic diseases, Sewage works, Tuberculosis, Typhoid.

A need exists for assessment of the potential health risks to the public from waters receiving waste discharges. Some insight concerning such risks may be gained from a review of studies of persons exposed on an occupational basis to waste water, i.e., those working at waste water treatment plants and in sewers. The most complete investigation in the literature was a retrospective study of Berlin sewer workers reported in 1954. This investigation revealed less evidence of occupational disease hazards than did some more limited studies which showed increased antibody levels to leptospirosis, frequent gastrointestinal illness, and increased parasitic infections, such as Endamoeba histolytica, Ascaris lumbricoides, and Trichurus trichiura. Studies on airborne transmission from waste water have thus far focused on bacterial levels near waste treatment facilities and not on health effects. (Bell-Cornell)
W77-01877

EFFECTS OF URANIUM MINING AND MILLING ON GROUND WATER IN THE GRANTS MINERAL BELT, NEW MEXICO,
Office of Radiation Programs, Las Vegas, Nev.
R. F. Kaufmann, G. G. Eadie, and C. R. Russell.
Ground Water, Vol. 14, No. 5, p 296-308, September-October 1976. 9 fig, 3 tab, 23 ref.

Descriptors: *New Mexico, *Uranium radioisotopes, *Mining, *Groundwater, Background radiation, Radium radioisotopes, Ion exchange, Nitrates, Environmental effects, Water pollution, Potable water, Municipal water.
Identifiers: *Uranium mining and milling, *Grants mineral belt, Ion exchange plant effluents, Radium, Selenium, Ore body, Environmental monitoring programs.

Groundwater contamination from uranium mining and milling resulted from the infiltration of mine, mill, and ion-exchange plant effluents containing elevated concentrations of radium, selenium, and nitrate. The discharge of such highly contaminated mine effluents into streams and seepage from tailings ponds created a long-lived source of groundwater contamination. The shallow aquifer in use and downgradient from another mill have been grossly contaminated with selenium, attributable to excessive seepage from a nearby tailings pond. Radium, selenium, nitrate, and, to a lesser extent, uranium were of most value as indicators of groundwater contamination. Gross alpha results were not consistent indicators of radium or uranium in water, although uranium did appear to be the principal contributor of alpha activity. Accurate radium-226 analyses yielded the most information for radiological evaluation of drinking water. At that time, no adverse impacts on municipal groundwater supplies had been observed. However, industry-sponsored environmental monitoring programs were inadequately designed and implemented and did not define the full, long-term impact of mining and milling operations on the groundwater quality of the study area. (Roberts-ISWS)
W77-01923

POSSIBILITIES FOR THE SYSTEMATIC ORGANIZATION OF AQUATIC BIRD HABITATS, (IN GERMAN),
L. Kalbe.
Beitr Vogelkd. 20(5), p 390-393, 1974.

Descriptors: *Lakes, *Oligotrophy, *Reproduction, *Birds, *Waterfowl, Vegetation establishment, Drainage practices, Drainage programs, Dredging, *Habitat improvement.
Identifiers: *Bird breeding, *Artificial islands, *Reed mowing, Rafts.

Four cases of successful oligotrophication of lakes are reviewed. The introduction of anchored rafts serving as artificial islands, reed mowing, annual or biennial drainage, the construction of new islands from dredging residue and the planting of new vegetation are proposed as measures for improving bird breeding conditions.--Copyright 1974, Biological Abstracts, Inc.
W77-01950

NITROGEN AND PHOSPHORUS UPTAKE IN THE EVERGLADES CONSERVATION AREAS, FLORIDA, WITH SPECIAL REFERENCE TO THE EFFECTS OF BACKPUMPING RUNOFF,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-02012

AN EVALUATION OF METHODS FOR MEASURING ALGAL GROWTH,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 5A.
W77-02018

EVALUATION OF THREE COLLECTING METHODS FOR A RECONNAISSANCE OF STREAM BENTHIC INVERTEBRATES,
Geological Survey, Menlo Park, Calif., and Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W77-02028

KINETICS OF SILICON-LIMITED GROWTH IN THE FRESHWATER DIATOM ASTERIONELLA FORMOSA,
Michigan Univ., Ann Arbor. Div. of Biology.
S. S. Kilham.
Journal of Phycology, Vol. 11, No. 4, p. 396-399, 1975. 2 fig., 2 tab., 20 ref. NSF GB-41315.

Descriptors: *Silica, *Diatoms, *Growth rates, Freshwater, Laboratory tests, *Kinetics, Succession, Europe, Lakes
Identifiers: *Asterionella formosa, Lake Ohrid(Jugoslavia), Lake Windermere(England).

Growth rates of two clones of the freshwater planktonic diatom Asterionella formosa were measured under conditions in which external silicon concentrations controlled growth in order to examine the kinetics of the growth response to limiting concentrations of silicon and to determine if intraspecific differences in response occur. Clone AfOH2 from Lake Ohrid, Jugoslavia, had a higher maximum growth rate (1.11 doublings/day) and apparent half-saturation constant (1.93 micromoles silicon) than clone L262 from Lake Windermere, England (0.61 doublings/day and 1.09 micromoles silicon). The silicon concentration where the growth rate equals 0.9 micron the maximum growth rate (above this concentration the nutrient is presumed to be non-limiting to growth) was 13.8 micromoles silicon for clone AfOH2 and 6.5 micromoles silicon for clone L262. These studies agreed with field observations showing A. formosa populations decreasing below 0.5 mg/l silicon dioxide (8.4 micromoles silicon). Calculations of yield showed a range of 0.5-1.5 micromoles silicon/million cells for clone AfOH2 and 0.6-1.9 micromoles silicon/million cells for clone L262. If similar relationships between physiological data and field observations can be shown for other species and clones of diatoms, more realistic models for seasonal successions of phytoplankton can be developed. (Buchanan-Davidson--Wisconsin)
W77-02035

STATEMENT OF CONCERNS OF THE LAKE MICHIGAN TOXIC SUBSTANCES COMMITTEE RELATED TO POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Chicago, Ill.
K. E. Bremer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 786, Price codes: A03 in paper copy, A01 in microfiche. Report July 1975. 29 p. 3 tab., 21 ref.

Descriptors: *Lake Michigan, *Polychlorinated biphenyls, *Hazards, *Regulation, Effects, Conferences, Fisheries, *Pesticide residues, Industries, Public health, Aroclor, Electric insulation, *Toxicity, Salmonids, Water pollution sources, Wisconsin, Michigan, Indiana, Illinois, Sewage effluents, Capacitors, Power transformers, Standards, Food chains.
Identifiers: PCB industrial uses, *PCB toxicity.

In view of the documented evidence on 19 biological and toxicological effects of PCBs, the committee, representing three federal agencies and the four states bordering Lake Michigan, proposed that all domestic and imported PCBs (marketed as various formulations of Aroclor) destined for industrial uses other than as a dielectric fluid in transformers and capacitors be banned; and the latter usages to be contingent upon development of replacement products. PCB concentrations in Lake Michigan fish are probably not decreasing and particularly the larger salmonids exceed the FDA 5 ppm maximum alowable levels. It is probable that this level will be further reduced in view of recent primate toxicological evidence. The only American manufacturer, Monsanto Company, has been unable to restrict distribution and agency efforts have not reduced PCBs in the lake. It is probable that treated sewage effluents are ubiquitous PCB sources at or below detectable levels. An economic loss has been inflicted on the commercial fishery and a much larger loss to the commercial and sport fishing industries would result if the FDA lowers the permissible levels. PCBs in many industrial processes and products continue to be widespread regardless of Monsanto's policy to restrict sales only to closed systems. Most PCB uses can be eliminated or replaced by substitute chemicals. (Auen-Wisconsin)
W77-02038

PICHIA SPARTINAE, A DOMINANT YEAST OF THE SPARTINA SALT MARSH,
Louisiana State Univ., Baton Rouge.
S. P. Myers, D. G. Ahearn, S. K. Alexander, and W. L. Cook.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 306, Price codes: A02 in paper copy, A01 in microfiche. Development in Industrial Microbiology, Vol. 16, p. 261-267, 1975 (Report No. LSU SG-75-R1, 8 p.) 3 fig., 2 tab., 9 ref. NOAA 04-3-158-19.

Descriptors: *Yeasts, *Salt marshes, *Plant physiology, *Energy conversion, Aquatic plants, Grasses, Reproduction, Symbiosis, *Louisiana, Microbiology, Microbial degradation.
Identifiers: *Pichia spartinae, *Spartina alterniflora, Sea grasses, *Barataria Bay(La), Oyster grass.

Production of Spartina alterniflora in Louisiana's coastal marshes is estimated at 2960 g dry wt/sq m/yr and the detrital formation from this plant biomass is the basis of the nutritional cycle of the entire estuarine system. This organic detritus is rich in carbohydrates and lipids which serve as nutrients for the yeast population of Pichia Spartinae, which is able to utilize the angiosperms as an energy source as well as a total nutrient source. Six major fractions of Spartina lipids were utilized by P. spartinae as sole carbon sources, while another marsh yeast, Kluyveromyces drosophilarum, utilized only the most polar lipid fractions. P. spartinae occurs in concentrations up to 90 million cells/g in intraculm cell liquid and viable tissues of Spartina. Highest densities occur at the outer Spartina surfaces during summer and early fall. In addition to lipids, P. spartinae assimilates plant hydrolysates, various amines, and both alpha and beta glucosides. Ascosporulation was observed most readily in fresh culm isolates and is frequently sparse in stock cultures. The beta-glucosidase activity of this yeast may have particular significance in detrital formation and associated protein formation. Emphasis is placed on the isolation of vigorously ascosporulating strains of P. spartinae from the intraculm of Spartina. (Auen-Wisconsin)
W77-02039

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
R. H. Rogers, and J. P. Scherz.
Report NASA CR-143409, Goddard Space Flight Center, Greenbelt, Md. August 1975. 44 p, 23 fig. NAS 5-20942.

Descriptors: *Data processin
*Satellites(Artificial), *Eutrophication, *Survey
*Lake Huron, Land use, Trophic level, Wisco
sin, Michigan, Suspended solids, Algae, Turbidit
Light penetration, Great Lakes Region.
Identifiers: *LANDSAT, *Saginaw Bay(La
Huron), ERTS.

The progress achieved during the three-mon
period ending August 11th of support surveillan
is reported. The satellite provided data for correl
tion with the Environmental Protection Agency
water quality survey and modeling of eutrophic
tion of Saginaw Bay in Lake Huron and
Michigan's Department of Natural Resources s
vey of lakes to determine their pollution potent
as related to land uses and various land cove
These categories can be classified and mapp
successfully using the LANDSAT data. Wisc
sin's Department of Natural Resources is also
tempting to develop a lake trophic level classifi
tion method and is evaluating the utility of LAN
SAT data. Results show that lakes can be cl
sified by LANDSAT data processing into typ
characterized by varying amounts of suspend
particles (algae and silt), colored solutes (tannin
weeds, and bottom reflectance. A techniq
developed eliminates surface noise effects
LANDSAT signals from water bodies; the resid
signal dependent only on the material in the wa
was used as a basis for computer categorization
type and concentration of suspended matter. L
summer was the preferred time to monitor trop
levels; primary production levels generally sta
ize during late August to early September. Bott
effects on lake reflectance were best identified
late spring when the water was clearest. (See a
W77-02042) (Auen-Wisconsin)
W77-02041

**APPLICATION OF LANDSAT TO THE SU
VEILLANCE AND CONTROL OF LA
EUTROPHICATION IN THE GREAT LAK
BASIN,**
Bendix Aerospace Systems Div., Ann Arb
Mich.
R H Rogers.
Report NASA CR-145699, Goddard Space Fli
Center, Greenbelt, Md. November 1975. 50 p.
fig., 4 tab., 21 ref., 4 append. NAS 5-20942.

Descriptors: *Satellites(Artificial), *Surve
*Eutrophication, Data processing, Michig
Ohio, North Carolina, Kentucky, Indiana, T
bidity, Suspended solids, Light penetration, C
ductivity, *Lake Huron, Watersheds(Basi
Chlorides, Chlorophyll, Phosphorus, Nitrog
Potassium, Calcium, Sodium, Magnesi
Forests, Agriculture, Mapping, Water temp
ture, Great Lakes Region.
Identifiers: *LANDSAT, ERTS, Sagi
Bay(Lake Huron).

A progress report for the three-month period e
ing November 11, 1975 details LANDSAT's ef
tiveness in concert with ground truth data. C
puter techniques for mapping 12 chemical
biological parameters in Saginaw Bay (L
Huron) demonstrated that the application of s
wise linear regression to ground truth meas
ments and corresponding LANDSAT meas
ments produced relationships that can be app
to map any one of these parameters for the e
bay. LANDSAT computer compatible t
(CCTs) were used for inventorying land use
225 drainage areas in the nine counties of the O
Kentucky-Indiana region. Computer tabulat
produced 16 land-use categories, which
merged into ten categories, and mapped at a 1:
scale, with detail to 0.44 hectare. These prod
were produced in less than 90 days at one cen
acre. CCTs were also used as a basis for inve
rying land cover within North Carolina's Ral
Durham-Chapel Hill area. Ten land cover ca
ries were interpreted at a detail of 0.44 hectare
included three urban densities, four forest ty
agricultural lands, bare soil-construction sites,

water. This taped data is being aggregated into 4-
ectare grid cells and merged with soils and slope
lata to compute sediment and nutrient flows. This
complete inventory was accomplished within 60
lays at a cost of about one-half cent per acre. (See
lso W77-02041) (Auen-Wisconsin)
W77-02042

OOD SELECTION AND FEEDING RELATION-HIPS OF YELLOW PERCH (PERCA FLAVESCENS MITCHELL), WHITE BASS MONONE CHRYSOPS (RAFINESQUE)), RESHWATER DRUM (APLODINOTUS GRUN-NIENS (RAFINESQUE)), AND GOLDFISH CARASSIUS AURATUS (LINNEAUS)), IN WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of
isheries and Wildlife.
). E. Kenaga, and R. A. Cole.
vailable from the National Technical Informa-
on Service, Springfield, VA 22161 as PB-251 208,
rice codes: A02 in paper copy, A01 in microfiche.
echnical Report No. 32.5, October 1975. 57 p. 11
g., 15 tab., 51 ref., append. X-290059.

escriptors: *Fish diets, *Lake Erie, Powerplants, *Fish food organisms, *Selectivity, Drums, *Yellow perch, *White bass, Heated ater, Size, Cooling water, Varieties, *Michigan, hermal pollution.
dentifiers: Goldfish, Monroe(Mich), *Raisin iver(Mich).

his investigation was oriented toward the impact f a once-through cooling system of a large power ant in western Lake Erie at the mouth of the aisin River near Monroe, Michigan, on the feed-g habits and efficiency of four fish species. arge prey organisms (Leptodora kindtii and hironomus) were selected by drum, white bass d yellow perch; those older than age 1 eat milarly sized organisms and thus may compete terspecifically, but young-of-the-year food con-mption is more diverse. Goldfish eat differently zed foods from the other fishes at all ages thus e not competitors. Any further depression in od sizes, such as might result from increased mbers of power plants or the loss of any one atively important prey specie, or a size-related ift in prey abundance, could cause a shift in eding intensity of the remaining organisms and turn affect the relative growth and fish species mposition. Zooplankton density did not appear limit growth, but their small size, in relation to edator size, may have decreased fish feeding ef-iency and growth rates. Power plant entrain-nt may cause more damage to large plankton n to smaller zooplankton because they may be re susceptible to mechanical damage in once-ough cooling systems. (Auen-Wisconsin)
7-02043

ETHOD OF EVALUATING THE CONTENT NATURAL RADIOACTIVE ISOTOPES OF E URANIUM AND THORIUM SERIES IN INKING WATER AND FOOD, (IN RUSSIAN),
L. Mordberg, and I. L. Shalaev.
Sanit 6, p 52-55, 1975.

scriptors: *Radioisotopes, *Uranium, *Potable ter, Radioactivity, Lethal limit, Water pollution ects, Toxicity.
ntifiers: *Thorium.

rmulas are presented for evaluating the (human) iation hazard of the uptake of radioactive opes of the U and Th series (U238,235, 234, 31, Th234, 232, 230, 228, 227, Ac227, Ra228, , 224, 223, Po210, Pb210) from water having n concentrations or from agricultural products wn on soil with a high natural background or taminated by these isotopes as a result of in-trial activity. The limits are given for the an-l uptake of isotopic soluble forms via the stive system for various organs (bone, gas-ntestinal tract, liver, spleen, and kidneys).--pyright 1976, Biological Abstracts, Inc.

W77-02070

5D. Waste Treatment Processes

FINAL REPORT, MSF MODULE STUDIES, OSW SAN DIEGO TEST FACILITY.
Burns and Roe Construction Corp., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W77-01551

HYGIENIC ASSESSMENT OF MEMBRANE METHODS OF WATER DESALINIZATION, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
Y. A. Rakhmanin, G. I. Rozhnov, and S. G. Davydova.
Gig Sanit 7, p 22-25, 1975.

Descriptors: *E. Coli, *Desalination, *Waste water treatment, Membrane processes, *Viruses, *Bacteriophages, Cellulose membranes, Public health, Bacteria.
Identifiers: *Adenoviruses.

The quality of water desalinized by various membrane methods depends on the type and construction of the installations used, the level of mineralization and the composition and properties of the treated water. Preliminary testing of water desalinized by the membrane methods for possible hygienic problems is recommended. The highly selective acetylcellulose membrane was not permeable to Escherichia coli and viruses (bacteriophages and adenoviruses).
W77-01554

HYGIENIC EVALUATION OF THE STATE OF PROTECTION OF A WATER BODY FROM POLLUTION IN THE REGION OF AN INDUSTRIAL COMPLEX, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
N. V. Klimkina, R. S. Ekhina, M. P. Gracheva, and Yu. P. Tikhomirova.
Gig Sanit 7, p 34-38, 1975.

Descriptors: *Waste water treatment, Waste water disposal, *Industrial wastes, Treatment facilities, *Toxicity, Water pollution sources, Rodents.
Identifiers: *USSR.

Although there was a constant increase in production and in the total volume of wastewater discharge in 1968-1973, the quantity of pollutants discharged with the wastewaters decreased slightly. In 1972-1973 the total pollutants in the wastewaters decreased by almost 2-fold in comparison with 1968. This was due to the construction of about 80 treatment plants at the industrial enterprises, organization of the consumption and disposal of water and reduction of pollutants in the wastewaters. The toxicological characteristics of industrial wastewaters before and after treatment (obtained in chronic experiments on mice) are presented.
W77-01555

HYGIENIC CHARACTERISTICS OF WASTE-WATER TREATMENT PROCESSES OF FLAX-PROCESSING PLANTS, (IN RUSSIAN),
V. F. Golubev.
Gig Sanit 7, p 109-110, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Biochemical oxygen demand, *Organic acids, *Pulp wastes, Textiles, Chemical oxygen demand.
Identifiers: Caproic acid, Valeric acid, Butyric acid, Propionic acid, Acetic acid, Formic acid.

The wastewaters of flax-processing plants have high 5-day biochemical O2 demand and chemical O2 demand and contain various organic acids (caproic, valeric, butyric, propionic, acetic, formic) and water-soluble gases. The water treatment plants can not provide purification of the wastewaters.
W77-01556

LAND DISPOSAL OF LIQUID SEWAGE SLUDGE: III. THE EFFECT ON SOIL NITRATE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
L. D. King, and H. D. Morris.
J Environ Qual. 1(4), p 442-446, 1972.

Descriptors: *Sludge disposal, Sewage disposal, *Soil contamination effects, *Liquid wastes, *Soil chemical properties, *Clay loam, Denitrification, Treatment, *Sludge treatment, *Sewage treatment, *Nitrates, Waste water disposal.
Identifiers: Cynodon-dactylon, *Cecil clay loam, Chemical fertilizer treatment.

A field experiment was conducted over a 2-yr period to determine the effect of liquid sewage sludge on soil nitrate content of a Cecil study clay loam (Typic Hapludults) to a 120-cm depth. Periodic applications of 4 rates of sludge to coastal bermudagrass (Cynodon dactylon L. Pers.) supplied a total of 4.4, 8.8, 10.0 and 20.0 cm of sludge in 1969 and 2.5, 5.0, 10.0 and 20.0 cm in 1970. Respective amounts of N applied by the 4 rates were 1037, 2074, 2580, and 5160 kg/ha in 1969 and 492, 984, 1970 and 3940 kg/ha in 1970. A chemical fertilizer treatment supplied 364 kg/ha of N in 1969 and 489 kg/ha in 1970. The 2 highest sludge rates affected significant increases in soil nitrate in the 0-120-cm profile. The other 2 sludge rates and the chemical fertilizer treatment did not increase soil nitrate and were deemed safe from the standpoint of potential groundwater pollution. At the 20-cm rate 40% (287 kg/ha) of the NO3-N present in the 0- to 120-cm profile in Oct. 1970 could not be accounted for the following May. Of the N supplied by the 10- and 20-cm applications, 17 and 9%, respectively, was recovered through crop uptake while 56 and 54% remained in the sludge crust that had accumulated on the soil surface.--Copyright 1973, Biological Abstracts, Inc.
W77-01557

EFFECTIVENESS OF METHODS OF IMPROVING DRINKING WATER QUALITY (FLUORIDATION, DESALINATION, MAGNETIC TREATMENT, ETC., (IN RUSSIAN),
Meditsinskii Institut, Saratov (USSR).
For primary bibliographic entry see Field 5F.
W77-01558

FORMATION OF WATER QUALITY BY AQUATIC ORGANISMS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5G.
W77-01561

OPERATING EFFICIENCY OF FACTORY SEWAGE TREATMENT PLANTS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Moscow (USSR).
L. A. Sergunina, E. S. Razumovskii, S. N. Bedimogov, A. M. Solygub, and K. P. Ershova.
Gig Sanit 5, p 93-96, 1975.

Descriptors: *Sewage treatment, *Waste water treatment, Treatment facilities, *Oxidation, *Aeration, *Activated sludge, Biochemical oxygen demand, Operations, *Performance.

Wastewater treatment plants with a capacity of 12-700 m3/day were developed. Plants with a capacity

of up to 200 m3/day use complete oxidation; aeration tanks with low organic pollutant loads (up to 100 mg 5-day biochemical O2 demand/g activated sludge per day) are used. Plants with capacity of 200-700m3/day use aeration with aerobic stabilization of activated sludge; aeration tanks with loads common for municipal treatment plants but without primary settling are used, and excess activated sludge is removed to and treated in aerobic stabilizers.--Copyright 1976, Biological Abstracts, Inc.
W77-01577

ORGANIZATION OF WORK ON THE SANITARY PROTECTION OF WATER BODIES IN THE RYAZAN OBLAST, (IN RUSSIAN),
Razanskii Meditsinskii Institut (USSR).
G. A. Strelyukina, E. V. Zaichik, M. P. Selin, and K. N. Chelikanov.
Gig Sanit 5, p 98-99, 1975.

Descriptors: *Water reuse, *Recycling, *Waste water treatment, Chemical wastes, Sewage treatment, Water pollution control.
Identifiers: Russian-SFSR, *Ryazan Oblast(USSR).

To prevent water pollution in the Ryazan Oblast (Russian SFSR, USSR), waste-water quantity is reduced by using water recirculating systems and by recovering chemical substances. More than 1 million m3 of water is recycled daily and about 200,000 tons of valuable ingredients are recovered from wastewaters annually. New treatment plants are being built. The goal is to eliminate completely the discharge of raw sewage into surface waters by 1980.--Copyright 1976, Biological Abstracts, Inc.
W77-01578

CONSIDERATIONS ON THE WASTE WATER QUALITY AND TREATMENT AT THE ANTIBIOTICS PLANT FROM JASSY, (IN HUNGARIAN),
A. Cicei, and E. Juriari.
Stud Epurarea Apelor 16(1-7), p 181-221, 1974.

Descriptors: *Water pollution sources, *Activated sludge, *Waste water treatment, Industrial wastes, Water pollution control.
Identifiers: *Antibiotics, *Romania.

The sources of antibiotics plant water pollution (Jassy, Romania) were analyzed and the reduction of their quantity and loading before entering the treatment plant were studied. The most efficient treatment methods use activated sludge.--Copyright 1976, Biological Abstracts, Inc.
W77-01580

RESEARCHES ON THE BIODEGRADABILITY AND TOXICITY OF SOME POLLUTANTS EXISTING IN WASTE WATERS DISCHARGED BY THE PETROCHEMICAL INDUSTRY, (IN HUNGARIAN),
For primary bibliographic entry see Field 5C.
W77-01581

LABORATORY RESEARCH METHODOLOGY OF WASTE WATER TREATABILITY BY ACTIVATED SLUDGE PROCESS, (IN HUNGARIAN),
L. Vaicum.
Stud Epurarea Apelor 16(1-7), p 7-49, 1974.

Descriptors: Methodology, *Activated sludge, *Organic matter, *Biological treatment, *Waste water treatment, Industrial wastes, *Sludge treatment, Microorganisms.
Identifiers: Respirometers, Warburg apparatus.

Biological treatment of waste waters containing predominantly organic matter is the most economical. Organic compounds are sometimes toxic for the microorganisms in the treatment facilities. To check the feasibility of biological treatment of organic industrial waste water, a laboratory research method for activated sludge treatment was devised. This method is based on respirometric experiments with the Warburg apparatus and on laboratory models of activated sludge treatment.--Copyright 1976, Biological Abstracts, Inc.
W77-01582

THE BIODEGRADABILITY OF SOME ORGANIC POLLUTANTS PRESENT IN THE WASTE WATERS RESULTED FROM THE PETROLEUM REFINERIES, (IN HUNGARIAN),
L. Vaicum, and L. Stefanescu.
Stud Epurarea Apelor 16(1-7), p 50-75, 1974.

Descriptors: *Biodegradation, Organic wastes, *Biological treatment, Microorganisms, Toxicity, *Activated sludge, Toxicity, *Waste water treatment, Industrial wastes, Organic compounds.
Identifiers: Mercaptans, Naphthenates, Respirometers, Sulfonates, Warburg apparatus.

Biological treatment of petroleum refinery waste water is affected by pollutants (e.g.,sulfonates,mercaptans,naphthenates) that are toxic for the microorganisms in the treatment plants. Pollutant biodegradability was studied by testing the respiration of activated sludge microorganisms in the presence of these substances in the Warburg respirometer and by observing the treatment efficiency in the laboratory. Naphthenic lyes did not inhibit the respiration of the microorganisms in the activated sludge, if the concentration of these lyes in the waste water does not surpass 500 mg/l. Sulfonic lyes were toxic only in concentrations above 50 mg/l. The toxic effects of sulfonic lyes are partially due to their emulsifying efficiency on petroleum products and to their foaming power. Allyl-mercaptan(pure) was very toxic for microorganisms even in small concentrations (5 mg/l).
W77-01583

SOME RESULTS OF THE FULL-SCALE TESTS OF THE LABORATORY RESEARCHES ON THE BIOLOGICAL TREATMENT OF WASTE WATERS FROM HOG BREEDING FARMS, (IN HUNGARIAN),
C. A. L. Negulescu, and E. Cute.
Stud Epurarea Apelor 16(1-7), p 222-234, 1974.

Descriptors: *Activated sludge, *Waste water treatment, Hogs, Farm wastes, *Biological treatment.

The activated-sludge process is easily applied to hog breeding farm waste water treatments.
W77-01584

RESEARCHES ON THE BIOLOGICAL TREATABILITY OF WASTE WATERS RESULTED FROM THE ORGANIC COLOUR SYNTHESIS, (IN HUNGARIAN),
L. Vaicum, T. Ognean, and L. Stefanescu.
Stud Epurarea Apelor 16(1-7), p 99-127, 1974.

Descriptors: Activated sludge, Biological treatment, Waste water treatment, Dyes, Dying, Industrial wastes, Color.
Identifiers: Respirometers, Warburg apparatus.

Complex physico-chemical and biological processes for treatment of dye industry wastes are discussed. The biological treatability of tritane dyes, the chromatable-, azo-and sulfur acids, and Faron, Resolin and Esterofil dyes was assessed. The Warburg respirometric procedure was used; the respiration of the activated-sludge suspension in the presence of waste waters treated, neutralized and diluted so that the concentration of organic matter would not cause inhibition was studied.
W77-01585

MODELLING OF PROCESSES AND PLAN FOR WASTE WATER SETTLING, (IN HU GARIAN),
A. Munteanu.
Stud Epurarea Apelor 16(1-7), p 128-180, 1974.

Descriptors: Model studies, *Pulp wastes, P and paper industry, Settling velocity, *Sett basins, *Treatment facilities, *Waste water tre ment, Operation, Performance.

Waste waters from a pulp and paper mill were died. Settling experiments were made with st suspensions. A correlation between water lay height retention time and settling efficiency established, and design parameters of sett plants were determined. Settling experiments w hydrodynamic suspensions showed that model according to the water velocity identity criter gives the best results. A small size model for ferent types of settlers is useful for improving e ciency.
W77-01586

MUNICH'S CONTRIBUTIONS TO SEWA FISHERY AND STREAM BIOLOGY, VOL. WATER FOR LAND RECLAMATION ARE (IN GERMAN),
Bayerische Biologische Versuchsanstalt, Mun (West Germany).
R. Oldenbourg Verlag: Muenchen, West Germa 1975, 334 p.

Descriptors: Biology, Water pollution, Sewa Cooling water, Water temperature, Waste w disposal, Waste water treatment, Aerati Ozone, Chlorination, Recreation, Viruses, *L reclamation.

Among the topics covered in this book are stre as ecological systems, water pollution monito systems, increased stream temperatures due cooling water from hydroelectric power plants, disposal of water from nuclear reactors, chem and biological testing of lakes used for recreati the epidemiological and epizootological nificance of pathogenic microorganisms in surf water and sewage, the use of O3 and Cl in rec tional waters and its bacteriological effects. discussed are virological studies at a sewage rification plant which uses O3, the use of a doned brown coal mines as reservoirs, water content, sewage disposal at campgrounds, the of recreational waters for fishing and the aera of lake and flowing waters.
W77-01598

HYGIENIC STUDY OF THE TOXIC PROP TIES OF METHANOL-CONTAIN RECLAIMED WATER, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-01602

EFFECT OF ABATE (DIPHOS) ON T GENERAL SANITARY CONDITIONS WATER BODIES: II, (IN RUSSIAN),
V. Yu. Akhundov, K. F. Akhundov, and A. P. Mamedova.
Izv Akad Nauk Az Ssr Ser Biol Nauk. 2, p 117. Illus. 1974. (Azerb. summ.).

Descriptors: *Pesticides, *Ammonium c pounds, *Nitrites, *Environmental sanitat *Water treatment, Organic compounds, Dissol oxygen, Biochemical oxygen demand, Nitri tion, Bacteria, Hydrogen-ion concentrat Model studies.
Identifiers: Diphos.

The sanitary conditions of experimen modeled waters treated with the pesticide di were studied. Addition of 88 and 92% diphos the waters increased the quantity of organic stances, including ammonium and nitrites. Di also decreased the O2 concentration in the wa

Small doses of 88% diphos (0.606 mg/l) and 92% diphos (0.055 mg/l) destroyed the normal course of the biochemical O2 demand process of the waters. The 0.055 mg/l dose of 92% diphos did not change the nitrification processes. Only the 0.055 mg/l dose of 92% diphos was not harmful in terms of bacteriological indices. Diphos did not change the pH of the experimental waters.--Copyright 1975, Biological Abstracts, Inc.
W77-01607

THE WASTE TREATMENT FACILITY OF MONADNOCK PAPER MILLS, INC.
American Paper Industry, Vol. 58, No. 9, p 10-13, September, 1976. 5 illus, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, *New Hampshire, Hydrogen ion concentration, Ammonia, Suspended solids, Biochemical oxygen demand, Aerated lagoons, Temperature, Oxygenation, Water purification, Oil, Turbidity, Coagulation, Settling basins, Tertiary treatment, Solutions, Polymers, Outlets.
Identifiers: *Contoocook River(New Hampshire), Clarifiers.

The effluent from the nonintegrated paper mill at Bennington, New Hampshire, producing 75 tons/day of technical grade and specialty papers, flows to a surge tank where NaOH is added to control pH and a cationic polymer (Aquafloc) is introduced along with ammonia. It then flows to a 45-ft diameter Dorr-Oliver Clariflocculator where most all of the settleable solids and about 94% of the total suspended solids, as well as approximately 30% of the BOD, are removed by coagulation and settling. Overflow from the Clariflocculator is treated with phosphoric acid before flowing into two 2,500,000 gallon aeration ponds. After secondary treatment, the effluent flows by gravity to the tertiary system where it is held for 3 days in two 500,000 gallon settling ponds. Overflow from the tertiary system passes into a stilling chamber where a sample is collected for pH and temperature analysis, and then through a flume equipped with a flow recorder and integrator. After leaving the flume, the effluent is mixed in line with air to insure complete oxygen saturation before discharging into the Contoocook River via a submerged and diffused outfall pipe. The treated effluent contains 15 ppm of suspended solids, no detectable settleable solids, 15 ppm BOD, and 1 ppm oil and grease, and has a Jackson turbidity value of 2. (Witt-IPC)
W77-01641

PRODUCTION OF A NEW EFFLUENT PURIFICATION SYSTEM (VNEDRENIE NOVOI SISTEMY OCHISTKI STOKOV),
Mayakovskaya Bumazhnaya Fabrika 'Mayak Revolutsii' (USSR).
A. Neroslavskii.
Bumazhnaya Promyshlennost, No. 6, p 27-28, June, 1976. 1 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Water purification, Suspended solids, Energy, Operating costs, Costs, Clays, Water pollution control, Industrial water, Water reuse.
Identifiers: *White water(Paper machines), COD, Fiber recovery, Filler recovery.

The Mayak Revolyutsii paper mill (Soviet Union) produces an assortment of printing and writing papers. Because the papers are highly sized and filled (containing up to 13-14% kaolin), the effluents have a high concentration of suspended solids. In 1978 the mill will install a new effluent treatment system, in which the machine white water will flow into a storage tank and be reused in the pulpers. When not used for this purpose, the white water will flow into a conical settling tank. The system will increase the degree of fiber and filler recovery from 78% to 94-96% and reduce the solids content in purified water from 150 to 46 mg/liter. The recovered fibers are used in making the high-quality papers. Other advantages are reduced power consumption and operating costs and a reduction of suspended solids in the overall mill discharge from 582 to 293 mg/liter. (Stapinski-IPC)
W77-01644

IRRIGATION OF CORN WITH EFFLUENTS FROM FERMENTATION AND YEAST-PRODUCING PLANTS (OROSHENIE KUKURUZY STOCHNYMI VODAMI GIDROLIZNO-DROZHZHEVOGO PROIZVODSTVA),
I. I. Omel'chenko, and T. N. Khruslova.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 3, p 22-24, 1976. 4 ref, 4 tab.

Descriptors: *Corn(Field), *Irrigation, Effluents, *Fermentation, *Yeasts, Fertility, Wastes, Industrial wastes, Water pollution sources, Soil properties, Water pollution control, Crops, Crop production, Waste water disposal, *Water reuse.

Untreated and diluted (1:1 with fresh water) effluents from the Nikolaev fermentation and yeast-producing plant (which uses sunflower and rice husks and corn stalks as raw material) were used to irrigate corn fields. The effluents improved soil fertility, increased the corn yield, and improved the quality of the grain. On the basis of these results, it is recommended that diluted effluents be used for irrigation during the growing season and undiluted effluents for fall and winter irrigation during field plowing. A suitable dose is 500-1000 cu m/ha. Because of widely varying composition of fermentation plant effluents, the manner of using them and the rate of applications should be determined at each plant on the basis of chemical analyses. (Stapinski-IPC)
W77-01645

ADDITION OF PHOSPHORUS SALTS TO EFFLUENTS (DOBAVLENIE SOLEI FOSFORA V STOCHNYE VODY),
Tsentralnyi Nauchno-Issledovatelskii i Proektnyi Institut Lesokhimicheskoi Promyshlennosti, Khimki (USSR).
G. A. Ishcherikova, L. S. Kamyshanova, and N. P. Drozdov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 3, p 11, 1976. 2 tab.

Descriptors: *Phosphates, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Neutralization, Lime, Hydrogen ion concentration, Calcium compounds, Phosphorus compounds, Salts, Chemical precipitation, Biological treatment, Aeration, Waste treatment, Water pollution treatment, Effluents, *Wood wastes.
Identifiers: *Pyrolysis.

At wood pyrolysis plants, the acidic effluents are neutralized with lime to a pH of 6.5-8.5, a process which results in the formation of soluble calcium salts, such as acetates. The precipitate is then separated from the neutralized effluent, soluble phosphorus salts (usually diammonium phosphate) are added, and the effluent is diluted and subjected to biological purification in aeration tanks. Because of the presence of calcium ions, little soluble calcium phosphates precipitate. The effect of the calcium ion concentration on the amount of soluble phoshates was investigated in model solutions and in the effluent of the Ashinsk wood-processing plant. The data show that the concentration of soluble phosphates depends directly on the concentration of calcium ions, and can be as low as 10% of the amount of the salt added. The higher the dilution of the effluent, the higher the concentration of soluble phosphorus. The phosphates should be added to the effluent after its dilution. (Stapinski-IPC)
W77-01646

BIOLOGICAL CLARIFICATION PLANT STARTED UP AT THE WIESLOCH CORRUGATED BOARD MILL (WELLPAPPE WIESLOCH NAHM BIOLOGISCHE KLAERANLAGE IN BETRIEB).
Neue Verpackung, Vol. 29, No. 7, p 727-728, July, 1976. 3 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Foreign countries, Biological treatment, Water purification, Biochemical oxygen demand, Europe, *Sludge treatment.
Identifiers: Germany, Board mills.

The Attisholz-system two-stage activated sludge treatment (first stage, bacterial and fungal sludge; second stage, protozoan sludge) of the effluent at the corrugated board mill of Holfelder Werke GmbH and Company, Wiesloch, Germany, is briefly described. Five-day BOD is reduced from 1400 to 20 mg/liter. (Speckhard-IPC)
W77-01647

TREATMENT OF HEAVY METALS IN WASTEWATER,
Industrial Pollution Control, Inc., Westport, Conn.
K. H. Lanouette, and E. G. Paulson.
Pollution Engineering, Vol. 8, No. 10, p 55-57, October, 1976. 3 fig, 2 tab.

Descriptors: *Heavy metals, *Industrial wastes, *Separation techniques, *Waste water treatment, Effluents, Water pollution sources, Wastes, Waste treatment, Water pollution treatment, Chemical precipitation, Coagulation, Sedimentation, Filtration, Adsorption.
Identifiers: Chelates, Complex compounds.

Heavy metals can be present in waste water streams from industrial processes in free inorganic or complexed organic form. Free heavy metal concentration can be reduced to acceptable levels by precipitation from solution and separation from the water by coagulation and sedimentation or by filtration. Heavy metals in complexed organic form are usually treated first in order to release the heavy metal, which is then precipitated from solution, or alternatively, by removing the complex from solution by adsorption. (Witt-IPC)
W77-01649

PRELIMINARY STUDY OF PULP MILL EFFLUENT DECOLORIZATION BY THE METHOD OF SIMULTANEOUS COAGULATION (WSTEPNE BADANIA ODBARWIANIA SCIEKOW CELULOZOWYCH METODA KOAGULACJI SYMULTANICZNEJ),
Technical Univ. of Warsaw (Poland).
M. Apolinarski, M. Roman, E. Skowyrski, Z. Ulaska, and J. Zielinski.
Przeglad Papierniczy, Vol. 32, No. 5, p 157-162, May, 1976. 5 fig, 3 ref, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Chemical precipitation, *Color, Wastes, Waste treatment, Industrial wastes, Water pollution treatment, Water pollution sources, Chemical oxygen demand, Activated sludge, Sedimentation, Biochemical oxygen demand, Coagulation, Water purification, Economics, Biological treatment, Foreign countries, Europe, Lignins.
Identifiers: Aluminum sulfate, Poland.

Despite the efficient operation of the effluent treatment system at the Ostroleka pulp mill (Poland), the purified effluents have a high COD and are strongly colored by non-biodegradable lignin compounds. Treatment of the effluents by the simultaneous coagulation method (i.e., the addition of coagulant to the aeration chamber of the biological purification plant) was studied in the laboratory to determine whether this method could achieve decolorization. The equipment consisted

essentially of an activated sludge chamber and a secondary sedimentation chamber. Determinations were made of the effect of various doses of aluminum sulfate on the reduction of COD, 5-day BOD, and color, and on the properties of the activated sludge. The coagulant dose ranged from 0 to 450 mg/cu dm. COD and color were reduced substantially, but only at the highest doses. At high coagulant doses, changes in the properties of the sludge occurred, including reduction of dehydrogenase activity and conversion of the sludge from predominantly bacterial to fungal. The reduction of BOD was about the same as in the absence of coagulant. The amount of excess sludge was increased due to precipitation of lignin. The purification process was sensitive to variations in effluent concentration. The simultaneous coagulation process is economical and effective for decolorization of effluents containing easily removable pollutants. For the case of the Ostroleka mill effluents, with high BOD and COD, a more economical solution includes separate coagulation before or after the biological treatment. (Stapinski-IPC)
W77-01650

DEWATERING OF ACTIVATED SLUDGE WITH FILTER BELT PRESSES,
Alton Box Board Co., Jacksonville, Fla.
V. L. Adams.
Tappi, Vol. 59, No. 9, p 54-56, September, 1976.

Descriptors: *Sludge treatment, *Dewatering, *Pulp wastes, *Activated sludge, Waste treatment, Solid wastes, Industrial wastes, Treatment facilities, Sludge, Polymers, Mixing, Waste treatment, Water pollution sources, Ultimate disposal, Filters, Conveyance structures.
Identifiers: Filter belt presses, Kraft mills, Board mills, Presses.

The gravity filter belt pressing system used by Alton Box Board Company (Jacksonville, Florida) to dewater sludge is described. Digested aerobic sludge from kraft pulp and paper mill effluents is pressed in D-J Sinus presses. The sludge enters a mixing tank where it is conditioned by polymers and mixing. It then flows from the mix tank onto the filter belt which conveys the sludge while allowing the water to drain. A series of plow and leveling rolls knead the sludge to aid in the dewatering. The filter belt then carries the sludge into the press section. Pressing is done by a solid neoprene belt that moves slightly faster than the filter belt. The sludge is removed by a doctor blade and falls into a screw conveyer for disposal. (Sykes-IPC)
W77-01651

COLOR REMOVAL IN A FERRIC CHLORIDE-LIME SYSTEM,
Institute of Paper Chemistry, Appleton, Wis.
H. S. Dugal, J. O. Church, R. M. Leekley, and J. W. Swanson.
Tappi, Vol. 59, No. 9, p 71-74, September, 1976. 4 fig, 4 tab.

Descriptors: *Pulp wastes, *Color, *Lime, *Waste water treatment, Chemical precipitation, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Sludge, Electrolytes, Bleaching wastes, Water pollution sources, Ions, Separation techniques, Iron compounds.
Identifiers: *Iron chloride.

Previous studies have shown that most of the color of kraft pulping wastes can be removed by precipitation with lime. It is shown in this study that over 50% of the color left by conventional lime treatment processes can be removed by incorporating certain polyvalent metal ions with lime. For example, additions of 100-300 ppm of ferric chloride with only 300-500 ppm of lime removed over 90% of the color from kraft pulp caustic bleach extract, compared to 72% removal with 600 ppm of lime only. More color was removed when the polyvalent metal ions were used with lime than when each was used individually, indicating that a synergistic effect existed. Below 1000 ppm of lime, the sludge obtained in this system settled slowly. (Sykes-IPC)
W77-01653

PURIFICATION OF PULP AND PAPER MILL EFFLUENTS BY RADIATION POLYMERIZATION. I. PURIFICATION WITH THE USE OF METHYL METHACRYLATE (OCHISTKA STOCHNYKH VOD PREDPRIYATII TSELLYULOZNO-BUMAZHNOI PROMYSHLENNOSTI METODOM RADIATSIONNOI POLIMERIZATSII. I. OCHISTKA S PRIMENENIEM METIL-METAKRILATA),
Belorussian State Univ., Minsk (USSR).
O. A. Gerasimovich, L. A. Kiseleva, A. V. Kireiko, A. M. Kovalevskaya, and E. P. Petryaev.
Vestsi Akademii Navuk Belaruskai SSR, Seryya Fizika-Energetychnykh Navuk, No. 3, p 33-37, 1975. 4 fig, 12 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Radiation, Wastes, Industrial wastes, Color, Lignins, Waste dilution, Biochemical oxygen demand, Hydrogen ion concentration, Water purification, Water pollution treatment, Water pollution sources, Waste treatment, Gamma rays, Laboratory tests.
Identifiers: *Methyl methacrylate, Black liquors, Kraft mills.

The purpose of this study was to develop suitable methods for radiation-chemical purification of kraft mill effluents, using methyl methacrylate as an additive. The laboratory study was conducted on solutions of kraft black liquor. Investigated were the effects (on the degree of color and lignin removal) of the gamma-ray irradiation dose, the methyl methacrylate concentration, and the black liquor concentration. Although the treatment is more effective in an atmosphere of nitrogen, irradiation was performed in air, i.e., under conditions similar to those used industrially. The effectiveness of the treatment increased with the dilution of black liquor and with the irradiation dose (up to 0.3 Mrad for a liquor concentration of 1%). Acidification of the liquor increased the degree of purification. The residual methyl methacrylate in the purified liquor (about 0.02%) did not affect BOD. The optimum conditions for the purification of a 1% solution of black liquor (approximating the concentration of digester room effluent) are a methyl methacrylate concentration not exceeding 1%, a radiation dose of about 0.2 Mrad, and a pH of 4-6, giving an 80-90% purification. (Stapinski-IPC)
W77-01655

USE OF OZONE IN A COMBINED SYSTEM FOR THE PURIFICATION OF KRAFT MILL EFFLUENTS (PRIMENENIE OZONA V KOMBINIROVANNOI SISTEME GLUBOKOI OCHISTKI STOCHNYKH VOD SUL'FATNO-TSELLYULOZNOGO PROIZVODSTVA),
Moskovskii Inzheniernyi-Stroitelnyi Institut (USSR).
Ya. A. Karelin, O. S. Khabarov, and Yu. P. Salamatov.
Vodnye Resursy, No. 3, p 137-140, 1975. 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Ozone, Toxicity, Effluents, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Chemical oxygen demand, Color, Hydrogen ion concentration, Phenols, Hydrogen sulfide, Organic compounds, Sulfur compounds, Toxins, Aquatic life, Water reuse, Economics, Foreign countries.
Identifiers: USSR, Condensates, Kraft mills.

Evaporator condensate, biologically purified effluent, and chemically purified effluent from the Baikal kraft mill (Soviet Union) were treated with ozone. The ozone treatment reduced the COD, color, and pH of all effluents and completely eliminated phenols, hydrogen sulfide, and organic sulfur compounds. Ozonization can be applied to all types of effluents and is particularly advisable for evaporator condensates. Ozonization did not produce any toxic substances that would affect aquatic life. The ozonized effluent can be recycled into production. On the basis of the results obtained in this study, technological processes were developed for the ozonization of evaporator condensates, for additional purification of chemically treated effluents, and for replacement of the chemical treatment stage by ozonization. Despite the additional costs for ozonization, the overall economic estimate is favorable, because of the recycling of a large amount of the effluents. (Stapinski-IPC)
W77-01656

MODERN METHODS OF PURIFYING PULP AND PAPER MILL EFFLUENTS (SOVREMENNYE METODY OCHISTKI STOCHNYKH VOD PREDPRIATII TSELLYULOZNO-BUMAZHNOI PROMYSHLENNOSTI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR); and Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidroliznoi Promyshlennosti, Moscow (USSR).
I. D. Tsvetkov, P. S. Varfolomeev, and N. E. Savgira.
Vodosnabzhenie i Sanitarnaya Tekhnika, No. 6, p 9-13, 1975. 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Water pollution control, Water purification, Efficiencies, Effluents, Recycling, Water reuse, Biological treatment, Color, Capital costs, Operating costs, Costs, Chemicals, Odor, Water pollution treatment, Waste treatment, Wastes, Industrial wastes, Pulp and paper industry, Energy.
Identifiers: Dry barking, Kraft mills, Continuous pulping, Condensates, Methanol, Turpentine, Fiber recovery, Oxygen-alkali bleaching.

In an attempt to reduce pollution of surface waters as well as the consumption of fresh water in the pulp and paper industry, new effluent treatment systems or modifications of the existing systems to improve their efficiency have been developed. These new systems and modifications are described and their expected effects are discussed. For example, switching to dry barking is considered, especially for large mills. At kraft mills the proposed changes include a generalized use of continuous digesters, processing of foul smelling condensates with recovery of methanol and turpentine, recycling of purified effluents and recovered fibers, and use of oxygen-alkali stages in pulp bleaching. Water purification systems, including biochemical, chemical, and mechanical treatments and combinations of these treatments have been developed for paper and board mills utilizing groundwood, semichemical pulps and chemical pulps; new methods have also been proposed for decolorization of effluents and utilization of sediments formed during various treatments. A table is given showing estimated investment and operating costs of purification equipment per cu m of effluent per day for 5 mills producing effluents in different amounts and degrees of pollution, as well as the estimated consumption of power and chemicals. (Stapinski-IPC)
W77-01657

WATER IN GENERAL AND ITS INDUSTRIAL USE IN PARTICULAR (ALLGEMEINES UBER DAS WASSER UND BESONDERES UBER SEINEN INDUSTRIELLEN GEBRAUCH),
For primary bibliographic entry see Field 3E.
W77-01661

BLEACH MODIFICATIONS TO REDUCE POLLUTANTS.
Weyerhaeuser Co., Everett, Wash.
J. L. Morrison.

: American Institute of Chemical Engineers, 0th National Meeting, Boston, Massachusetts, eptember 7-10, 1975, Paper No. 24D, 27 p. 13 fig, ref, 1 tab.

escriptors: *Bleaching wastes, *Pollutants, Color, *Water pollution control, Water pollution urces, Wastes, Industrial wastes, *Chlorination, quipment, Costs, Chemicals, Pulp and paper in- ustry, *Waste water treatment.
entifiers: *Hypochlorites, Alkaline extrac- on(Pulp), Chlorine compounds.

eduction in pollutants, particularly in color sub- ances, have been achieved by changing the con- ntional bleaching sequences, especially by using quential in lieu of customary chlorination, and substituting hypochlorite for the first alkaline traction stage. The modified sequence can be ed by existing bleach plants without equipment odifications at equivalent or only slightly higher emical costs. (Brown-IPC)
77-01663

SE OF CHLORINE DIOXIDE-ALKALI FOR IGH-YIELD PULPING,
stitute of Paper Chemistry, Appleton, Wis.
A. Nicholls.
: American Institute of Chemical Engineers, th National Meeting, Boston, Massachusetts, ptember 7-10, 1975, Paper 12F, 21 p. 5 fig, 11 f, 3 tab.

escriptors: *Water pollution control, *Pulp and per industry, *Lignins, Water pollution sources, kalis(Bases), Odor, Bleaching wastes, conomics, Energy, Costs, Wastes, Industrial astes, Effluents, *Waste water treatment.
entifiers: *Chlorine dioxide, Delignification, lping processes, Fiberization.

onsulfur delignification of wood with chlorine oxide plus alkali offers environmental ntipollution) advantages (no odor and no bleach ant effluent), but is presently economically dis- vantaged, owing largely to high fiberization ergy input and oxidant costs, since much of the lorine dioxide is consumed in reacting further th lignin that has already been rendered alkali- luble. (Brown-IPC)
77-01664

N OVERVIEW OF NEW PULP BLEACHING EVELOPMENTS,
ooker Chemicals and Plastics Corp., Niagara lls, N. Y.
deV. Partridge.
: American Institute of Chemical Engineers, th National Meeting, Boston, Massachusetts, ptember 7-10, 1975, Paper No. 24A, 28 p. 2 fig, ref, 3 tab.

escriptors: *Bleaching wastes, Research and velopment, *Water conservation, Chlorine, one, Effluents, Oxygen, Biochemical oxygen mand, Color, Toxicity, Chlorides, Cellulose, gradation(Decomposition), Water pollution urces, Wastes, Industrial wastes, Steam, Pump- , Energy, Diffusion, Pulp and paper industry, ater reuse, Effluents, Industrial water, *Waste ter treatment.
entifiers: *Pulp bleaching, Oxygen bleaching, roxide bleaching, Countercurrent washing, Dif- sion bleaching, Chlorine monox- (Hypochlorous acid anhydride), Wash water, lp washing.

velopments in pulp bleaching are strongly in- enced by the need to utilize existing equipment d to minimize water and energy use in old mills, d to reduce capital and energy expenditures in w facilities. Promising new approaches using lorine and chlorine derivatives include gas- ase and diffusion processes with various ef- ent recovery systems. Oxidative methods using ygen, peroxides, or ozone are also reviewed. Countercurrent reuse of wash liquors can reduce effluent volumes perhaps as much as from 20,000 to 4,000 gal/ton of pulp. Diffusion bleaching promises to reduce this further to about 2,600 gal/ton with simultaneous reductions in steam consumption and pumping energy. Bleaching with molecular oxygen or the use of the Hooker antipollution sequences can drastically reduce bleaching effluent BOD, COD, color, toxicity, and chloride content. The effluent-free bleached kraft mill concept promises to find realization in the Rapson-Reeve system currently undergoing practical trials. The future of chlorine monoxide (hypochlorous acid anhyd ride) to bleach moist pulp is not yet clear, as it causes severe cellulose degradation. (Brown-IPC)
W77-01665

BARK AS NON-INERT TRICKLING FILTER MEDIUM FOR PULP MILL EFFLUENT,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
G. R. Lightsey, and J. W. Mitchell.
In: American Institute of Chemical Engineers, 80th National Meeting, Boston, Massachusetts, September 7-10, 1975, Paper No. 36H, 35 p. 11 fig, 14 ref, 7 tab.

Descriptors: *Bark, *Trickling filters, *Pulp wastes, *Waste water treatment, Pine trees, Sludge treatment, Dewatering, Bleaching wastes, Biochemical oxygen demand, Chemical oxygen demand, Color, Electrical conductance, Soil amendments, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Wood wastes, Nitrogen, Filtration, Conductivity, Waste water disposal, Filters, Byproducts.
Identifiers: Kraft mills.

Pine bark from a kraft mill was examined for effectiveness as a sludge-dewatering and trickling filter medium. Eight filter models were tested with either primary sludge or bleach plant effluent from a kraft mill. Bark filter depths from 1 to 6 ft and hydraulic loading rates from 1.15 to 36.8 gal/sq ft/day were used. Results showed the bark filters to remove up to 95% of the BOD plus significant amounts of COD, color, and settleable matter. At the same time, the electroconductivity of the filtrate increased. Removal efficiencies did not change significantly after the liquid passed through about 3 ft of bark. The optimum loading rate for maximum BOD and COD percentage removal was 9.2 gal/sq ft/day, but higher hydraulic loadings gave greater total BOD and COD removals. After about 2-months use as a trickling filter medium, the nitrogen content of the bark (and hence its value as a soil conditioner) increased significantly. The filtered liquid was suitable for land disposal. (Brown-IPC)
W77-01666

TOXIC CONSTITUENTS IN WOODROOM EFFLUENTS,
B. C. Research, Vancouver (British Columbia).
For primary bibliographic entry see Field 5B.
W77-01667

DISPOSAL OF FLEXO INK WASHUP WASTE WATER,
P. F. Pratte.
Tappi C. A. (Committee Assignment) Report No. 51, p 81-82, 1975. 6 ref.

Descriptors: *Waste water treatment, *Chemical industry, Pulp and paper industry, *Flocculation, *Chemical precipitation, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Filtration, Sedimentation, Water reuse, Water pollution treatment, Equipment, Design, Construction, Chemicals, Separation techniques, Adhesives, Effluents.
Identifiers: *Printing presses, *Wash water, Printing inks, Corrugated board, Box plants, Graphic arts, Paper converting industry, Packaging industry.

Brief descriptions are given of the Clearator, Expunger, Flexo-O-Kleer, and Color Tamer systems for clarifying flexographic press waste water from corrugated box plants. While different in design and construction, these systems are based on the same principle; chemicals are added to the effluent to flocculate and precipitate the residual ink and other substances so that they can be separated from the water by filtration and/or sedimentation. Reuse of the press wash water in the preparation of corrugating adhesive is also discussed. (Witt-IPC)
W77-01670

UDDEHOLM (FOREST INDUSTRIES) -- KAMYR CLOSED BLEACHED PLANT (AT SKOGHALL, SWEDEN),
Uddeholm A. B. Skoghall (Sweden).
K. A. Anderson.
In: TAPPI Alkaline Pulping/Testing Conference, Dallas, Texas, September 13-15, 1976. Preprinted Proceedings. TAPPI, Atlanta, Georgia, p 191-195. 6 fig, 1 tab.

Descriptors: *Bleaching wastes, *Color, *Waste water treatment, Pulp and paper industry, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, *Pulp wastes, Chemical oxygen demand, Biochemical oxygen demand, Capital costs, Operating costs, Costs, Foreign countries, Effluents, Chlorine, Europe, Closed conduits.
Identifiers: Countercurrent washing, Pulp washing, Kraft mills, Sweden, Chlorine compounds, Closed systems.

Based on experience with full-scale decoloration (by adsorption on resin) of effluent from the first alkaline extraction stage, a process was developed for the treatment of total bleach plant effluents. The installation, designed to serve a 250 ton/day kraft bleach plant, has provided color reduction of about 90%, with 80% COD reduction and 50% reduction. Another significant feature of the process is tight countercurrent washing in the bleach plant. Effluent from the alkaline extraction stage is decolored and used as wash water in the chlorination stage. The input of chlorides is 10-12 kg or less, as NaCl per ton of pulp. Even low-molecular weight chlorine compounds are removed from the effluent. Investment and operating costs for the system are discussed; operating costs for fully bleached softwood kraft pulp are about $1.00 per ton of pulp. (Sykes-IPC)
W77-01671

TREATMENT OF CONTAMINATED CONDENSATES,
Sandwell International Inc., Portland, Oreg.
G. W. Hough, and R. W. Sallee.
In: TAPPI Alkaline Pulping/Testing Conference, Dallas, Texas, September 13-15, 1976, Preprinted Proceedings. TAPPI, Atlanta, Georgia, p 243-249. 7 fig, 3 ref, 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Waste treatment, Industrial wastes, Water pollution sources, Water pollution treatment, *Biochemical oxygen demand, Odor, Biological treatment, Sulfur compounds, Toxicity, Aerated lagoons, Activated sludge, Economics, Costs, Operating costs, Capital costs.
Identifiers: *Condensates, Black liquors, Terpenes, Air stripping, Steam stripping, Reduced sulfur compounds.

Digester relief and blow vapor condensates have a BOD ranging from 10 to 20 lb/ton of pulp, depending on wood species, type of pulp, and type of digester. The BOD of condensates from black liquor evaporation may range from 20 to 30 lb/ton of pulp, of which possibly 70% is contained in a third of the volume. These condensates are also rich in terpenes and odorous compounds and cannot be discharged without treatment for pollution abatement. Condensates can be treated to remove odorous compounds (air or steam stripping) or

BOD compounds (biological treatment or steam stripping). Steam stripping reduces the total reduced sulfur and the toxicity by more than 95%, and BOD by 60-85%, depending on the number of plates in the column and the ratio of steam to feed. Air stripping removes 90% or more of the total reduced sulfur and a significant amount of the toxicity, but reduces BOD by only 10-20%. Biological treatment in aerated lagoons or activated sludge systems is approximately 90% efficient in BOD removal. The economics of the different treatment processes are also discussed. (Sykes-IPC)
W77-01672

WHITEWATER SYSTEM CLOSURE IN NSSC CORRUGATING MEDIUM MANFACTURE,
Green Bay Packaging Inc., Wis.
J. E. Jayne, and G. O. Walraven.
In: TAPPI Alkaline Pulping/Testing Conference, Dallas, Texas, September 13-15, 1976, Preprinted Proceedings. TAPPI, Atlanta, Georgia, p 29-38. 10 fig, 2 ref, 1 tab.

Descriptors: *Water reuse, *Water conservation, *Pulp and paper industry, Water pollution sources, Water pollution control, Wastes, Reverse osmosis, *Recycling, Hardwood, Wisconsin, Pulp wastes, Operation and maintenance, Water balance, Recirculated water, Industrial water, Water utilization, Waste water treatment, Waste treatment, Water pollution treatment.
Identifiers: *Board mills, White water(Paper machines), Closed systems, Waste paper.

Green Bay Packaging Inc. (Green Bay, Wisconsin) produces 300 tons/day of corrugating medium from neutral sulfite semichemical (NSSC) pulp made from mixed hardwoods and from recycled box plant clippings. Over the last 5 years, the mill has been converted to an essentially closed white water system. Although almost all showers are fed with screened white water, the paper machine is a net consumer of water due to the higher consistency of stock leaving the digester area than entering the dryers. Many small dilute waste streams can be accepted in the recycle loop without upsetting the water balance. Any imbalance is corrected by reverse osmosis. Although most operating problems of reverse osmosis have been solved, flux rates are somewhat lower than had been predicted. The reduction of pollutant losses by capture and recycle results in a discharge of minimal ecological impact. (Sykes-IPC)
W77-01673

PROCESS OF EXTRACTION OF ORGANIC SUBSTANCES FROM PULP MILL EFFLUENTS (PROCEDE D'EXTRACTION DE SUBSTANCES ORGANIQUES D' EFFLUENTS D' USINES DE PATE DE BOIS).
French Patent No. 2,233,289, June 10, 1974. 7 p. 1 fig, 2 claims.

Descriptors: *Pulp wastes, *Color, *Bleaching wastes, *Patents, Separation techniques, *Ion exchange, Organic compounds, Wastes, Industrial wastes, Water pollution sources, Hydrogen ion concentration, Phenols, Resins, *Waste water treatment, Waste treatment, Water pollution treatment.

A process for extracting organic substances from pulp mill effluents using a bed of ion-exchange resin (preferably a phenolic resin with aminated functional groups) in a column involves activating the resin with an acidic solution and passing the effluent through the activated resin at a pH significantly higher than that of the liquid phase of the bed (preferably alkaline). In particular, variations in resin volume are avoided by intermittent additions of acidic solution during effluent treatment such that the pH of the liquid phase is periodically lowered. The process is particularly applicable to the decoloration of bleaching effluent. (Speckhard-IPC)
W77-01674

PROCESS AND INSTALLATION FOR DECOLORING WASTE WATERS (PROCEDE ET INSTALLATION POUR LE TRAITEMENT DE DECOLORATION D' EAUX USEES).
French Patent No. 2,235,091, June 26, 1974. 14 p. 3 fig, 10 claims.

Descriptors: *Bleaching wastes, *Pulp wastes, *Color, *Patents, *Filtration, *Calcium hydroxide, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Pulp wastes, Separation techniques, Water pollution treatment, Water pollution sources, Alkalis(Bases), Calcium compounds.
Identifiers: Kraft mills, Causticization, Green liquor(Kraft process).

A process for decoloring pulp mill effluents (particularly bleaching effluents from a kraft pulp mill) by filtration of the effluent through a bed of calcium hydroxide is characterized in that the calcium hydroxide bed is formed on a screen and is periodically renewed, the unused calcium hydroxide in the replaced bed being employed in the causticization of green liquor. (Speckhard-IPC)
W77-01675

METHOD OF PRODUCING CHAR FROM PULP MANUFACTURING WASTE LIQUOR,
Sanyo-Kokusaku Pulp Co. Ltd., Tokyo (Japan).
For primary bibliographic entry see Field 5E.
W77-01676

1975 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
G. Gove.
NCASI Stream Improvement Technical Bulletin, No. 284, 48 p, February, 1976. 236 ref.

Descriptors: *Reviews, *Waste water treatment, *Pulp wastes, *Bleaching wastes, *Water quality control, Pulp and paper industry, United States, Byproducts, Recycling, Water reuse, Water conservation, Industrial wastes, Industrial water, Color, Flotation, Coagulation, Biological treatment, Suspended solids, Sludge treatment, Aerated lagoons, Treatment facilities, Pollutant identification, Water pollution sources, Water analysis, Instrumentation, Effluents, Municipal wastes, Waste water(Pollution), Reverse osmosis, Activated sludge, Ultimate disposal, Biodegradation.

This annotated survey of publications on the U.S. paper industry's water quality control and waste treatment progress during 1974/1975 deals with the following topics: Pollutant sources and receiving waters; analytical procedures; disposal and recovery of spent pulping liquors (recovery of cooking chemicals and by-products); physicochemical treatments (waste water renovation and reuse, solids removal, color reduction, chemical coagulation, ultrafiltration and reverse osmosis, flotation, oxidation and stripping, sludge handling); and secondary treatments (activated sludge, aerated stabilization basins, joint municipal-industrial treatment, fixed-bed reactors, biodecomposition, pilot and laboratory studies). (Witt-IPC)
W77-01678

AN INVESTIGATION OF THE SEPARABILITY AND REUSE POTENTIAL OF THE ASH COMPONENT OF HIGH-ASH CONTENT PAPER MILL SLUDGES,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
A. M. Springer.
NCASI Stream Improvement Technical Bulletin, No. 285, 76 p, June, 1976. 5 fig, 10 ref, 29 tab.

Descriptors: *Sludge treatment, *Pulp wastes, Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Sludge, Colo
Brightness, *Waste treatment, Pigment
*Recycling, Pollution abatement.
Identifiers: Fillers, White water(Paper machine
Papermaking, Coated papers, Chemical recovery

This report presents (1) the results of semi-pilo
scale studies of several means for separating t
ash component from the fibrous organic portion
fine paper mill primary sludge, and (2) pilot-pla
paper machine trials with the reuse of this materi
either as filler or coating pigment for filled a
coated paper grades. Vibratory screening fra
tionated the sludge into a reusable high filler co
tent fraction and a highly organic fraction. Fro
50 to 75% of the sludge may be reclaimed as reu
ble material. Although it caused some reduction
paper brightness, the possibility of brightening t
recovered filler by oxidative bleaching appears e
couraging. Wet oxidation also produced a reusa
filler, which had less adverse effects on pa
brightness than the screen-recovered product, b
the wet-oxidized material was not suitable as
coating pigment. (Buchanan-IPC)
W77-01679

**PLANNING FOR REGIONAL WASTE WAT
SYSTEMS,**
Massachusetts Dept. of Community Affa
Boston.
T. R. Angotti.
Growth and Change, Vol. 6, No. 2, p 36-42. A
1975. 2 tab.

Descriptors: *Planning, *Waste water treatme
*Water quality, *Water pollution, *Social aspe
*Costs, *New Jersey, Waste disposal, Recreati
Benefits, Land use, Effluent.
Identifiers: Bergen County Sewerage Auth
ty(NJ), North West Bergen County Sewe
Authority(NJ).

Questions concerning the effectiveness and s
economies of regional waste water systems,
the relationship between location, scale of w
water treatment and collective facilities and
structure of social and economic relations wi
the metropolitan region were investigated.
Hackensack drainage basin and its Bergen Co
Sewerage Authority (BCSA), a NJ portion o
New York City metropolitan area, were ch
for study. Large scale regional plans have
equated in the past with large-scale water t
ment plants. It was found that the present regi
system of BCSA was a major contributor to
pollution. A small regional waste water sys
the N.W. Bergen County Sewerage Auth
(NWBCSA), has maintained high levels of w
quality. A decentralized system is recomme
wherein costs and recreation benefits
equitably distributed, and strict surveillanc
water quality in all portions of the basin can
Economies of scale were exhibited by the B
for both capital and operating costs, as well a
treatment plant and intercepting system
State and federal pollution control policies te
to support social class divisions and inequit
the distribution of wealth. A majority of wate
lution control grants in NJ have been ma
systems serving affluent suburban commu
neglecting inner cities where pollution pro
are more severe and there is less ability to p
water pollution control. In the study area, re
waste water systems were installed after g
had taken place rather than before so that c
costs were higher and the system was not u
guide development corresponding with a
prehensive land use plan. (Gentry-North Car
W77-01690

**REPORT OF RESEARCH AND RESE
NEEDS ON WATER QUALITY PROBLE
THE STATE OF HAWAII.**
For primary bibliographic entry see Field 5G
W77-01698

AGNETIZATION OF IRON CHROMIUM
YSTEM,
ord Motor Co., Dearborn, Mich. (Assignee).
W. Butler.
S. Patent No. 3,960,723, 8 p, 4 fig, 3 tab, 6 ref;
fficial Gazette of the United States Patent Of-
e, Vol 947, No 1, p 307, June 1, 1976.

escriptors: *Patents, *Waste water treatment,
ndustrial wastes, *Water pollution treatment,
etals, Ion exchange, Separation techniques,
emical precipitation, Filtration.
entifiers: Metal etching industry, Magnetized
rous particles.

is invention relates to a process for treating
ueous waste solutions containing complexing or
idizing agents and dissolved metallic elements
compounds of copper, chromium, nickel, lead
tin. The waste solution is treated with finely di-
ded magnetized ferrous particles, continuing
ch treatment to allow for homogeneous stirring
omoting substantial ion exchange between the
lute and ferrous particles, and providing a post-
atment step using an agent to promote precipita-
n of metallic hydroxides. The precipitates are
parated from the solution by deposition in a set-
g tank and/or filtration. (Sinha-OEIS)
77-01709

REATMENT OF CONDENSATES,
ciete d'Assistance Technique pour Porduits
stle S.A., Lausanne (Switzerland). (Assignee).
Kleeman, and W. Rothmayr.
S. Patent No. 3,972,809, 4 p, 6 ref; Official
zette of the United States Patent Office, Vol
9, No 1, p 255, August 3, 1976.

escriptors: *Patents, *Industrial wastes,
rganic wastes, *Water pollution treatment,
ater pollution control, Water quality control,
ater purification, Ion exchange, Resins, Chemi-
l oxygen demand, Food processing industry,
Vaste water treatment.
entifiers: Coffee production.

process for purifying an aqueous liquid resulting
m the condensation of vapors emitted by an
ueous extract of a vegetable material is provided
which the liquid is treated with at least one ion
change resin. The effluent obtained after treat-
nt with the ion exchange resins may be either
scharged as waste water or be utilized for the
ueous extraction of a fresh batch of vegetable
terial. This latter application is particularly ad-
ntageous with the production of extracts of
getable materials such as coffee, chicory or tea.
has been found that utilizing the treated liquid
ds to an improvement in the aromatic charac-
istics of the resulting product. The vapors
itted during evaporation entrain certain aro-
tic constituents of the plant material that were
t removed during the preliminary stripping so
at a portion of these constituents, present in the
rified effluent, is re-introduced into the extrac-
n cycle. Anionic or cationic ion exchange resins
ay be chosen from the resins industrially availa-
e. The appropriate quantity of resin is expressed
a proportion of the quantity of aqueous liquid to
treated and the amount of purity desired. The
nditions of flow of the aqueous liquid through
e ion exchange resin, provided that they
present a turbulence-free flow are not critical in
lation to the process nor is the temperature of
e treatment critical. (Sinha-OEIS)
77-01716

LTER, ESPECIALLY FOR BACK WATER,
yrens Verksted A/S, Oslo (Norway). (Assignee).
J. Moe.
S. Patent No. 3,972,817, 6 p, 4 fig, 5 ref; Official
zette of the United States Patent Office, Vol
9, No 1, p 258, August 3, 1976.

escriptors: *Patents, *Waste water treatment,
Vater purification, *Pulp wastes, *Filtration,
Water quality control, Water pollution control,
Water pollution treatment, *Filters, Fibers, Pulp
and paper industry.

The filter of this invention is of the type in which
the static pressure in the liquid to be filtered can be
more effectively utilized, so that it is not necessa-
ry to equip the filter with complicated suction
means to achieve an effective filtration. The filter
is characterized in that the vessel takes the form of
a closed drum which is rotatably mounted about a
horizontal central axis, and that the filter elements
extend between and are connected to the end walls
of the drum for rotation about the central axis
together with the drum. The filter elements at one
end extend through the end wall of the drum and
since it is open at this end unobstructed discharge
of the filtrate is permitted. A high average screen-
ing pressure differential and better screening
capacity are achieved. A blow tube with nozzle
means is provided within the filter element to
remove solids from the filter surface when this ele-
ment is above the liquid level in the drum. The
filter is especially intended for the wood pulp in-
dustry, primarily for filtering of back water for
recovering fibers and purifying the back water.
However, it may also be used for thickening of
pulp tec. Outside the wood pulp industry, the filter
may be used e.g. as clean water filter and for
recovery, purification and thickening of screena-
ble suspensions in general. (Sinha-OEIS)
W77-01720

WATER RECYCLE TREATMENT SYSTEM FOR USE IN METAL PROCESSING,
Data General Corp., Southboro, Mass. (Assignee).
D. E. Hewitt, and T. J. Dando.
U.S. Patent No. 3,973,987, 6 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 673, August 10, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water pollution control, Water quality control, Industrial wastes, *Water reuse, Return flow, Filtration, Neutralization, Reverse osmosis, Evaporation, *Recycling.
Identifiers: Metal processing industry.

A water recycle treatment system is comprised of two main treatment sub-systems to separate out the impurities in contaminated water from concentrated solutions and rinse baths. A first sub-system treats less concentrated solutions used for rinse baths by channeling the flow to a first neutralizing tank which provides for pH control to produce a mixed output solution having a substantially constant pH factor. It is filtered to remove gross particles, cooled in a holding tank and then passed through a reverse osmosis process and carbon bed to produce clean water. The second sub-system treats highly concentrated solutions obtained from chemical processes, mixes them in a second neutralizing tank which is utilized to produce a substantially constant pH output. It is fed to an evaporator to precipitate the metals and salts in sludge and to form a water vapor output. The waste from the reverse osmosis process is processed in the second sub-system. (Sinha-OEIS)
W77-01724

PROCESS AND CYCLONE REACTOR FOR FIRE DECONTAMINATION OF INDUSTRIAL WASTE WATER CONTAINING ORGANIC AND REFRACTORY MINERAL IMPURITIES,
M. N. Bernadiner, A. A. Dobrovolsky, and B. S. Esilevich.
U.S. Patent No. 3,974,021, 7 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 684, August 10, 1976.

Descriptors: *Patents, *Industrial wastes, *Chemical wastes, Water pollution sources, *Pollution abatement, *Water pollution treatment, Burning, Incineration, *Waste water treatment.
Identifiers: Cyclone reactors.

A process is described for fire decontamination of industrial waste water containing organic and refractory mineral impurities. The waste water containing organic impurities and fusible mineral impurities is sprayed into a reactor which is maintained at a temperature which will burn out the impurities. A melt of fusible minerals is formed on the reactor walls. The waste water is fed into the reactor in such a manner that during the burning, the refractory mineral impurities penetrate the film of melt of fusible minerals and is discharged from the reactor. The reactor is provided in the top portion of its vertical cylindrical chamber with burner apparatus arranged tangentially to the chamber to create a whirling flow of combustion products. Injection nozzles for feeding waste water are arranged below the burners in at least two transverse planes. The injection nozzles in the upper plane are radially directed and adapted for feeding the waste water containing organic and fusible mineral impurities, and injection nozzles in the lower plane of the chamber are adapted for feeding waste water containing organic and refractory mineral impurities. The nozzles are directed at an angle with respect to the chamber walls so that the waste water is introduced into the whirling flow of combustion products. (Sinha-OEIS)
W77-01725

APPARATUS FOR REMOVING PARTICLES AND CHEMICALS FROM A FLUID SOLUTION,
M. L. Hulse.
U.S. Patent No. 3,975,257, 9 p, 7 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1105, August 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, *Water pollution treatment, Water pollution control, Acidic water, Metals, Electric fields, Recycling, Water reuse, Equipment, *Electrolysis.
Identifiers: Metal etching industry, *Electrets.

The invention involves a method and apparatus for neutralizing etching agents, and separating metallic and fibrous particles and particulate matter from a fluid solution to reduce the particle level in the solution and condition it to permit its reuse in a manufacturing process and its ultimate disposal without adverse effects to the environment. A plastic material carrying an electrostatic charge, known as an electret, is placed in contact with the fluid solution. The particles which contact or come near the electret will adhere to its surface. The etching agents are neutralized by a chemical reaction with an arrangement of a metal element. The apparatus includes a receiving tank or container having its side walls formed from an electret material and having a series of baffles extending between the side walls and transverse to the path of flow. The baffles are also formed from the electret material. The fluid rinsing solution will be forced in circuitous and turbulent path through the container causing metal and particulate matter to settle out and a great percentage of particles to be removed by the electret material. The solution is discharged from the container into a filter having a generally cylindrical shell formed from similar electret means. From the filter, the solution may be recycled directly to the manufacturing process to be reused in washing the manufactured articles to remove metal chips etc. (Sinha-OEIS)
W77-01737

DEWATERING PROCESS,
S. S. Baize.
U.S. Patent No. 3,975,266, 4 p, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1108, August 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Sludge treatment, Sludge disposal, Dredging, Separation techniques, Flocculation, *Dewatering, Centrifugation, *Water pollution treatment, Water pollution control.

A dewatering process for the separation and recovery of sludge from water reservoirs, such as lakes, ponds, lagoons, rivers and the like is provided. The process includes the steps of dredging the reservoir, thickening the suspended matter in the water, dewatering thickened matter and, then, recovering the sludge. The process further contemplates the addition of a flocculant to the dredged material between the dredging and thickening steps and/or between the thickening the dewatering steps. The invention is adapted for treatment of primary and secondary sludge and it is also amenable to treatment of activated sludge by providing an intermediate stage between the dewatering step and thickened matter recovery step. It further provides a two-stage process for introduction of the flocculant into the process stream. The two-stage process prevents degradation of the flocculant, especially where anionic or cationic polymeric flocculants are employed.
W77-01738

PURIFICATION OF INDUSTRIAL WASTE WATERS BY FLOTATION,
Swift Co., Chicago, Ill. (Assignee).
E. R. Ramirez.
U.S. Patent No. 3,975,269, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1109, August 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water purification, Electrolysis, Bubble, Flocculation, Separation techniques, Foaming, *Flotation.
Identifiers: Microbubbles.

A method of purifying industrial waste water is disclosed where microbubbles consisting primarily of oxygen, hydrogen, or air having certain micron sizes and of sufficient number and volume are formed. Particles with or without the use of a coagulant in the water are attracted to the bubbles by difference in electrostatic charge to form embryo flocs. The addition of a polyelectrolyte is then made so that a full floc is formed which includes the microbubbles. This light floc is promptly surfaced by the buoyance factor provided by the microbubble. The process is suitable for all types of industrial waste water. Microbubbles are generated in the waste water system either by mechanical means or by electrolysis. A feature of this invention is that the flocculants are added only after the microbubbles have been formed and this condition leads to the formation of a final floc consisting of at least three phases; namely, a water phase, a gas phase (microbubbles) and, a floc phase consisting of metal hydroxides and foreign water impurities. (Sinha-OEIS)
W77-01740

PROCESS FOR RECOVERING USABLE OLIVE-PROCESSING LIQUOR FROM OLIVE-PROCESSING WASTE SOLUTION,
Department of Agriculture, Washington, D. C. Office of the Secretary.
R. Teranishi, and D. J. Stern.
U.S. Patent No. 3,975,270, 3 p, 12 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1109, August 17, 1976.

Descriptors: *Patents, Water pollution sources, *Food processing industry, *Water pollution control, *Pollution abatement, *Recycling, Sludge, Separation techniques, Water reuse, *Waste water treatment.
Identifiers: Lye, Olive processing.

The lye (or alkaline) solution employed in the initial soaking of fresh olives becomes contaminated with organic impurities. These impurities impart a deep brown color and an extremely unpleasant odor to the lye solution. Because the biological oxygen demand (BOD) of this waste is extremely high, it cannot be released into municipal sewage treatment systems without first being diluted with enormous quantities of water. The invention provides a means for obviating the problem and the contaminants in the lye solution may be removed so that the purified liquor can be recycled. After olives are soaked in and removed the lye solution, the liquid is directed to a tank where lime is added. The contents are stirred for a short period and then charcoal is added to the slurry and stirring is continued for approximately 15-30 minutes. At this point calcium carbonate is added to the stirred slurry. Stirring is continued and then the slurry is pumped to another tank where the slurry is allowed to settle. Usually, complete settling takes place in about 30 minutes to an hour. The liquor is removed from the settled contaminants and is ready for reuse. Only the settled contaminants (sludge) must be disposed of and since the volume of waste is small, disposal is not difficult. In fact it may be used as fertilizer because it contains only organic contaminants, the lye having been removed and recycled. (Sinha-OEIS)
W77-01741

PROCESS FOR STERILIZING WATER BY THE COMBINATION OF CHLORINE AND ANOTHER HALOGEN,
For primary bibliographic entry see Field 5F.
W77-01742

MODULAR AERATOR AND SEPARATOR ASSEMBLY FOR SEWAGE TREATMENT FACILITY,
L. A. Schmid.
U.S. Patent No. 3,975,276, 7 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1111-1112, August 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Water pollution control, Water quality control, Aeration, Separation techniques, Turbulence, Diffusion, Equipment, *Treatment facilities.

An efficient, modular, drop-in type aeration and separation assembly for use in relatively small sewage treatment facilities is disclosed which includes perforated aeration conduits or diffusers placed adjacent the sewage inlets of the apparatus for inducing an upwards directed hydraulic suction or 'pumping action' which serves to increase the turbulence and aeration of sludge and other solid entering and collected within the unit. The assembly includes a multi-tube particulate removal unit which effectively removes entrained solid from sewage passing upwards in conjunction with an inverted V-shaped grease collector positioned below the multitube separator which also serves as an air diffuser to facilitate selective air cleaning of the latter. Air conduit means are provided for the selective delivery of compressed air beneath the grease collector for even diffusions and the conduit also permits suction removal of grease or the like trapped within the collector so that the assembly can be easily cleaned without the necessity of shutting down the overall treatment facility for extended periods. (Sinha-OEIS)
W77-01743

METHOD OF BIOLOGICAL PURIFICATION OF SEWAGE,
Akvadan A/S (Denmark). (Assignee).
B. K. Tholander, and S. Krarup.
U.S. Patent No. 3,977,965, 9 p, 18 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 949, no 5, p 2024, August 31, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Water purification, Biological treatment, Anaerobic conditions, Aerobic conditions, Aeration, Mixing, Separation techniques, Denitrification.

A method of biological purification of sewage in a purification plant uses three tanks, of which at least two sequentially serve as a feeding tank for the sewage and one as a clarification tank. The sewage at any time is subjected to an aerobic tre
ment by means of aeration and simultaneous circ
lation of the sewage. It was found that due to t
fact that at least two tanks are used alternativ
as feeding tanks and between these periods
being used for aerobic treatment, a considera
amount of sewage, which during apreceding s
of the method has been subjected to an aero
treatment and also to a nitrification, will
present in the tank when it is used as a feed
tank and, accordingly, the nitrates produced
be reduced by the microorganisms. Moreover,
growth of such microorganisms will be suppor
by the fresh organic materials added to the ta
Therefore good biological purification will
achieved. As each tank discharges liquid
responding to the amounts of liquid supplied,
tanks work with the same degree of filling. Du
the fact that a tank is always driven aerobic
after an anaerobic period and before it is used
clarification tank, a decomposition of orga
materials is always secured. (Sinha-OEIS)
W77-01746

**PURIFICATION OF NON-BIODEGRADAB
INDUSTRIAL WASTEWATERS,**
Sterling Drug Inc., New York. (Assignee).
L. A. Pradt, and J. A. Meidl.
U.S. Patent No. 3,977,966, 6 p, 2 fig, 3 ref; Offi
Gazette of the United States Patent Office,
949, no 5, p 2024, August 31, 1976.

Descriptors: *Patents, *Waste water treatm
*Water pollution treatment, *Industrial was
*Oxidation, Separation techniques, *Activ
carbon, Biological treatment, Heat, Press
Chemical oxygen demand, Water reuse.
Identifiers: *Wet oxidation, Regeneration.

A process for treating nonbiodegradable indus
wastewaters comprises subjecting the wastew
to wet oxidation at a temperature between 150
375 deg. C. and a pressure between 150 and
psig so that a reduction of between 30 and 99
cent in chemical oxygen demand is obta
separating the gaseous, liquid and solid ph
The liquid phase is oxidized in an aeration co
tank containing a biomass suitable to effect bi
ical oxidation of the organic solutes present i
liquid phase while maintaining powdered activ
carbon in the aeration contact tank in an am
sufficient to enhance the bio-oxidation and
stantially reduce the odor and color. The biolo
oxidation is carried out until excess biomass b
up and the activated carbon becomes spent.
a mixture of the excess biomass and spent c
is transferred to a wet oxidation reactor an
mixture is oxidized under conditions simil
those used for the wet oxidation of the waste
so as to regenerate the powered activated c
for further use in the biological oxidation ste
at the same time disposing of the excess bio
(Sinha-OEIS)
W77-01747

ION EXCHANGE REGENERATION,
Nalco Chemical Co., Oak Brook, Ill. (Assign
For primary bibliographic entry see Field 5F.
W77-01748

**SEPARATION CHAMBER, HOLDING T
DRAINAGE SYSTEM,**
R. M. Purcell.
U.S. Patent No. 3,977,978, 8 p, 9 fig, 4 ref; O
Gazette of the United States Patent Offic
949, No 5, p 2029, August 31, 1976.

Descriptors: *Patents, *Waste water trea
*Water pollution treatment, *Sewage trea
*Domestic wastes, Septic tanks, Drainage
Soil disposal fields, Waste disposal, Water
tion sources.

This invention involves a superimposed sep
chamber, holding tank, drainage system in

modular units are stacked one on top of the other to form a drainage system covered by a holding tank and topped off by one or more annular separation chambers. One or more drainage rings, open at their tops and bottoms and each with a number of large apertures through their walls are stacked to form the drainage system. A cone shaped louver, also open top and bottom, is fitted in each drainage ring. The holding tank is stacked on top of the uppermost drainage ring to separate the drainage system from the septic tank and is formed with a sludge accumulating basin. One or more annular separation chambers is then stacked on top of the holding tank. Each annular separation chamber is subdivided by divider walls each decreasing in height in a predetermined fluid flow direction, and with every other one of the divider walls provided with an upward angled pipe. (Sinha-OEIS)
W77-01750

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
Ciba-Geigy Corp., Ardsley, N. Y. (Assignee).
H. Wegmuller, and J. Haase.
U.S. Patent No. 3,979,285, 9 p, 12 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 262, September 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Water purification, Absorption, Cellulose, Color, Chemical precipitation, Pulp and paper industry, Textiles.
Identifiers: Leather industry, *Decolorization.

The invention relates to a process for the purification of industrial effluents, especially for the decolorization of waste liquors arising in the textile, paper and leather industry in which the effluents are brought into contact with cellulosic absorbent which has been pretreated with precipitants. The effluents which result from dyeing, washing and tanning processes are brought into contact in the undiluted state with cellulose material pretreated with precipitants. The cellulose to be used as carrier material consists of bleached or unbleached spruce sulphite cellulose, Kraft cellulose or waste sheets from printing. Suitable precipitants are in principle compounds which are adsorptively bound by the cellulose and which at the same time exert a precipitating or retaining action on the residual substances. In this respect, water-soluble basic aminoplasts such as formaldehyde-dicyandiamide condensation products have proved suitable. (Sinha-OEIS)
W77-01757

APPARATUS FOR THE PURIFICATION OF EFFLUENT,
Societe Anonyme pour l'Etude et l'Exploitation des Procedes Georges Claude, Paris (France). (Assignee).
P. Boulenger.
U.S. Patent No. 3,979,293, 6 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 265, September 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water pollution control, *Water purification, *Oxygenation, *Activated sludge, Mixing, Equipment, *Biological treatment.

A process is provided for the purification of effluent using an oxygen-rich gas in which the effluent is mixed with a biologically activated sludge. The effluent/sludge mixture thus obtained is oxygenated and then is introduced into a treatment zone in which a quantity of activated sludge is fixed on vertially disposed, mobile discs immersed with the treatment zone and a further quantity of activated sludge is in suspension in the effluent undergoing treatment. The injection of oxygenating gas is preferably effected through the lower portion of part of the oxygenation zone, in which the direction of mass flow is upwards. In this way, the oxygenating gas which is injected acts as a 'gaslift' which is utilized as a mechanical means for introducing the effluent/sludge mixture to the treatment zone. (Sinha-OEIS)
W77-01760

ENTERIC VIRUS SURVIVAL IN PACKAGE PLANTS AND THE UPGRADING OF THE SMALL TREATMENT PLANTS USING OZONE,
Kentucky Water Resources Research Inst., Lexington.
L. S. Cronholm, J. K. McCammon, M. Fleischman, J. R. Perrich, and V. Riesser.
Research Report No. 98, November 1976. 109 p., 23 fig., 24 tab., 42 ref. OWRT A-059-KY(1). 14-31-0001-5017 14-31-0001-6018.

Descriptors: *Waste water treatment, Water quality, *Ozone, Treatment facilities, *Viruses, Kentucky, *E. coli, *Disinfection, Microorganisms, Enteric bacteria, *Chlorination.
Identifiers: Ozonation, *Enteric viruses, Poliovirus.

Post-chlorinated effluent collected with a portable viral concentrator from four treatment plants in Jefferson County, Kentucky, yielded infective viral particles from three plants from spring through late fall. The pH, chlorine, turbidity, and coliform levels of these effluents indicated that viral persistence was correlated with inefficient processing which produced effluent environments that inhibited disinfection by chlorine. The disinfection potential of ozone was tested on secondary effluents and finished water seeded with poliovirus and Escherichia coli. Low doses of ozone inactivated viruses and bacteria in treated water, but not in effluent. The inactivation of bacteria by ozone does not appear to be caused by cell lysis. Inability of poliovirus to form plaques correlated with inhibition of capsid penetration. Electron micrographs revealed that ozone degraded capsids. Ozonation produced low levels of COD and TOC reduction in package plant effluent. Since the reaction rates were not a simple function of COD levels and ozone dose it would be difficult to standardize dose rates. The relative inefficiency of ozone in reduction of biological and nonbiological pollutants in effluents, combined with its high cost, does not favor a recommendation for ozonation as a tack-on process.
W77-01809

A ROTATING FLIGHTED CYLINDER FOR SOLID-LIQUID SEPARATION AND BIOLOGICAL WASTE TREATMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. R. Miner.
Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-48, September 1976. 73 p, 25 fig, 18 tab, 5 ref, 2 append. OWRT A-031-ORE(2).

Descriptors: *Waste treatment, *Separation techniques, *Farm wastes, *Sedimentation, *Biological treatment, Treatment facilities, Equipment, Performance, Operations.
Identifiers: *Solid-liquid separation, *Rotating flighted cylinders.

A single device for solid-liquid separation and biological waste treatment was designed, built, and evaluated. The device, a rotating flighted cylinder, consists of a cylindrical tube which has a helically wound fin mounted perpendicular to the interior surface. When mounted at a slight incline (7 to 15 degrees) and slowly rotated (1 to 3 rpm), the device provides a mechanism to accomplish sedimentation between wraps of the fin. The settled solids are augered toward the upper end and discharged as a solids-rich stream. The fin surfaces, alternately exposed to the waste and the atmosphere, perform conversion of soluble organic matter to bacterial cells in a manner similar to rotating disk processes. Overall, the rotating flighted cylinder was demonstrated to be a simple, low cost, low energy-consumptive device for the treatment of small domestic and agricultural waste flows. Where a temporary or seasonal treatment unit is needed, it has some particular advantages over conventional package plants.
W77-01815

RECREATIONAL REUSE OF MUNCIPAL WASTEWATER -- PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
M. Headstream, R. M. Sweazy, D. M. Wells, and R. C. Baskett.
Interim Report WRC-76-2, April 1976. 84 p, 25 fig, 2 tab, 67 ref. OWRT C-6053 (No. 5205) (1).

Descriptors: *Water reuse, *Phosphorus, *Eutrophication, *Recreation, Lakes, *Algae, *Nutrients, Cycling nutrients, *Texas, Municipal water, Ponds.
Identifiers: *Lubbock(Tex), Canyon Lakes project(Tex), *Multiple reuse of municipal wastewater, Algal growth.

Impending water shortages through the southwestern United States have provided the impetus for the conception and implementation of various water reuse plans. A leader in this area is Lubbock, Texas. The city has been using its treated municipal effluent for irrigation purposes for over 35 years and is now in the process of making a second reuse of the wastewater. A series of recreational lakes being built in Yellowhouse Canyon, north and east of the city, will be fed with reclaimed percolated effluent. Recognizing the potential problems inherent in recreational reuse projects, a model of the Canyon Lakes Project consisting of nine common-wall concrete ponds was constructed. The makeup water for the ponds was recovered percolated effluent of comparable quality to that which will be used in the actual project. The model system provided an excellent opportunity for ascertaining the suitability of reclaimed percolated municipal wastewater for recreational purposes, as well as an opportunity for more clearly defining the role of phosphorus in an aquatic environment. Researchers conducted studies relative to water quality, algal growth and control, suitability of the water for fish life and recreational contact, critical phosphorus levels, and the factors affecting the availability of phosphorus for algal growth. The results not only will be of value to the City of Lubbock in helping to maintain an aesthetically pleasing system of lakes but also will be applicable to the successful operation of other warm water impoundments in the southern United States. (See also W75-01853 and W74-01103)
W77-01824

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PILOT STUDY, FIVE INDUSTRIES,
Conference Board, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-01959

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, CHEMICAL AND ALLIED INDUSTRIES,
International Research and Technology Corp., Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-01960

WATER POLLUTION CONTROL ACT OF 1972, COSTS AND CAPABILITIES, WATER TREATMENT SYSTEMS,
American Water Works Association Denver, Colo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 039.

Price codes: A04 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/103, July 1975, 67 p. WQ5AC094.

Descriptors: *Water treatment, *Waste water treatment, Water pollution, Federal Water Pollution Control Act, Economics, Forecasting, Water quality, Cost analysis.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An assessment is made of the anticipated impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on water treatment system requirements and costs. In the aggregate, the cost to the majority of water utilities that stand to benefit from the law far outweighs the gain. In the opinion of many water utility and state regulatory officials, implementation of the effluent guidelines as proposed is not cost effective in the majority of cases. Only a small percentage of water utilities that reported an improvement in water quality also reported a reduction of costs. The financial benefits expected to accrue from implementation of the act are essentially insignificant. (NCWQ)
W77-01963

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, PUBLICLY OWNED TREATMENT WORKS, (VOLUMES 1, 2 AND 3).
Metcalf and Eddy, Inc., Boston, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 690, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/43, March 1976, 1,404 p.

Descriptors: *Combined sewers, *Waste water treatment, *Construction costs, *Treatment facilities, *Operating costs, *Capital costs, Rainfall, *Estimated costs, Runoff, Sewers, *Pollution abatement, Sewage treatment, Sludge disposal, Water pollution control, Water quality.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An assessment of the state-of-the-art of technology has shown that municipal needs for wastewater collection and treatment can be met. Construction of additional facilities required by 1990 entails a capital cost of $62 billion (June, 1973 dollars) and 150 million man-days of on-site manpower. The increase in annual operation and maintenance requirements between 1972-1973 and 1990 involves an estimated cost of $1.2 billion (92% increase), manpower of 14 million man-days (53%) and electrical energy consumption of 10 billion kilowatt-hours (150%). Discharges of BOD and suspended solids in 1990 will be 60% and 55% less than in 1972-73, respectively. Raw sludge production will increase by at least 5 million tons (dry solids) per year (110%+). Eight strategies for controlling combined sewer overflows were formulated with capital costs of $1.2 to $68 billion and 1990 operation and maintenance costs of $46 to $400 million per year. Estimates of resources and residuals were prepared. (NCWQ)
W77-01982

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, STEAM ELECTRIC POWER INDUSTRY, (VOLUME 1, 2 AND 3).
Taknekron, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5G.
W77-01983

DISPOSAL OF WASTEWATER RESIDUALS, (VOLUMES 1 AND 2).
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5E.
W77-01984

THE METSEP PROCESS FOR THE SEPARATION AND RECOVERY OF ZINC, IRON, AND HYDROCHLORIC ACID FROM SPENT PICKLE LIQUORS,
National Inst. for Metallurgy, Johannesburg (South Africa).
T. H. Tunley, P. Kohler, and T. D. Sampson.
Journal of the South African Institute of Mining and Metallurgy, Vol. 76, No. 10, p 423-427, May, 1976. 3 fig, 10 tab, 1 ref.

Descriptors: *Waste water treatment, *Chemical industry, *Byproducts, Reclamation, Acids, *Zinc, Ion exchamge. *Separation techniques, Chemical reactions, Liquid wastes, Industrial wastes, Chemical wastes, Treatment facilities, *Iron.
Identifiers: *Hydrochloric acid recovery, Pickle liquors.

The Metsep Process for recovering hydrochloric acid from spent pickle liquors contaminated with appreciable concentrations of zinc chloride (up to 100 grams/liter) is described along with the installation of a spray roaster which incorporates this process. The process involves contacting the zinc-contaminated spent pickle liquor with a weak-base ion-exchange resin in a continuous countercurrent ion exchange plant working on the Cloete-Streat principle in order to separate the zinc from iron chloride which is also present in the spent liquor. In a liquid-liquid extraction plant, the zinc ion (Zn (++)) is then reacted with di-2-ethyl-hexyl-phosphoric acid solvent to form a complex and hydrochloric acid. The hydrochloric acid is removed in the raffinate, and the loaded solvent is contacted with strong sulfuric acid to form zinc sulfate, with the solvent being converted into its original form. Satisfactory operation of a spray roaster plant incorporating the Metsep Process has been achieved since coming into full operation in 1973. (Kreager-FIRL)
W77-01987

DYE CATALYZED OXIDATION OF INDUSTRIAL WASTES,
Alaska State Dept. of Environmental Conservation, Juneau.
J. W. Sargent, and R. L. Sanks.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE5, p 879-895, October, 1975. 11 fig, 1 tab, 25 ref.

Descriptors: Chemical industry, *Waste water treatment, *Oxidation, *Photoactivation, *Dyes, Chemical reactions, *Phenols, Aerobic conditions, Kinetics, Feasibility studies, *Industrial wastes, *Chemical wastes.
Identifiers: *Cresols.

The effectiveness of dye-sensitized aerobic photooxidation as a waste water treatment technique was investigated, with particular emphasis on the photooxidation of phenol and cresol using visible light. Dye-sensitized aerobic photooxidation was achieved by employing conventional methods of aeration, mixing, and handling of waste streams. Tungsten incadescent lamps proved to be an effective light source, and methylene blue and Rose Bengal were the most effective dye sensitizers. Although the rate of dye-sensitized aerobic photooxidation decreased with increasing liquid layer thickness, significant substrate destruction was achieved with a liquid layer thickness of almost 2 in. Both cresol and phenol were destroyed by dye-sensitized aerobic photooxidation, with the former being destroyed faster than the latter: the optimum initial cresol concentration for maximum rate of aerobic photooxidation sensitized by 5 milligrams/liter of methylene blue was about 50 milligrams/liter (minimum cresol half-life was 2.45 minutes). Dye sensitized aerobic photooxidation appears to be a potentially valuable waste water treatment technique based on the above findings. (Kreager-FIRL)
W77-01988

KODAK DISPOSES OF WASTE IN SYSTEM THAT HELPS PAY ITS WAY,
R. A. Young, and I. O. Lisk.
Pollution Engineering, Vol. 8, No. 9, p 48-49, September, 1976. 1 fig.

Descriptors: *Sludge treatment, *Solid wastes, *Industrial wastes, *Incineration, *Reclamation, Byproducts, Symbiosis, Treatment facilities, Chemical industry, Chemical wastes, Waste disposal, *Waste treatment, Recycling.
Identifiers: *Photography processing wastes, recovery.

An Eastman Kodak combustible waste disposa unit that reclaims heat, produces steam, an recovers silver is described. A refuse handling sec tion of the system has the capacity to break up a many as 180 tons/day of paper, packaging wastes and general plant trash from four of Kodak' manufacturing plants. A sludge drying sectio which uses its own heat flash dries sludge fro Kodak's waste water treatment plant. A com bustion section generates steam for plant opera tions by burning the refuse and sludge in a suspen sion-fired boiler. Approximately 77,00 pounds/hour of steam are produced as a byproduc of the refuse combustion, and the steam is used t drive a turbine which generates electricity for th plant. Silver is recovered from bottom ash in th boiler and from flyash collected by an electrostati precipitator. About 30 tons/day of the ash ar generated and treated for silver recover (Kreager-FIRL)
W77-01989

YEAST PLANT WASTEWATER TREATMENT,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
Y. C. Wu, and C. F. Kao.
Journal of the Environmental Engineering Div sion, Proceedings of ASCE, Vol. 102, No. EE5, 969-984, October 1976. 7 fig, 4 tab, 12 ref.

Descriptors: *Activated sludge, *Waste wat treatment, *Food processing industry, *Feasibili studies, *Biological treatment, Industrial waste Liquid wastes, Color, Kinetics, Biochemical o ygen demand, Chemical oxygen deman Suspended solids, Organic compounds, Efficie cies, *Yeasts.

The feasibility of treating yeast plant waste wat in a 2-stage activated sludge process (complete mixed, continuous flow) was investigated alo with the effectiveness of using alum for col removal. At an initial organic loading rate of 0. pounds 5-day biochemical oxygen d mand/day/pound mixed liquor volatile suspend solids, the 2 stage activated sludge process wi detention times of 6 and 18 hr in the 1st and 2 stages, respectively, removed approximate 96.0%, 77.8%, and 99.3% of the total 5-d biochemical oxygen demand, chemical oxygen d mand, and suspended solids, respectively, a produced an effluent containing 74 milligrams/li 5-day biochemical oxygen demand, 1600 mi grams/liter chemical oxygen demand, and 34 mi grams/liter of suspended solids. However, diluti and pH adjustment to neutral were required bef treatment. The 2-stage activated sludge proc produced the following biokinetic properties in t 1st and 2nd stages, respectively, on a 5-d biochemical oxygen demand basis: maxim specific growth rates of 1.23 and 1.14/day, satu tion constants of 554 and 610 milligrams/liter, a cell yield coefficients of 0.944 and 0.700. Althou alum was useful for color removal, the effect dosage required was high. The 2-stage process pears to be superior to conventional 1-stage tivated sludge processes with respect to orga substrate and suspended solids remov (Kreager-FIRL)
W77-01990

HYSICAL-CHEMICAL METHODS FOR THE ECOVERY OF PROTEIN FROM WASTE EF-LUENT OF POTATO CHIP PROCESSING,
ichigan State Univ., East Lansing. Dept. of Crop nd Soil Sciences.
. Meister, and N. R. Thompson.
ournal of Agricultural and Food Chemistry, Vol. 4, No. 5, p 919-923, September/October, 1976. 3 g, 5 tab, 21 ref.

escriptors: *Food processing industry, *Waste ater treatment, *Proteins, *Reclamation, Byproducts, Nutrients, Chemical precipitation, occulation, Foods, Heat, Sedimentation, Cen-ifugation, Acidity, Chemical reactions, Separa-on techniques, Efficiencies, *Industrial wastes, iquid wastes.
dentifiers: *Potato chip processing wastes ecovery.

mple physical-chemical methods for recovering rotein from potato chip processing waste effluent ere evaluated. Sedimentation or centrifugation ter heating, pH adjustment, or both yielded milar amounts of protein. A daily recovery of out 170 kg of dried potato protein (550 kg of od containing 30% protein) was estimated as eing feasible based on the operations of an verage potato chip plant processing 31 metric ns of potatoes/day. Heat (80-90 C) at pH's of 4-5 was the most effective treatment for protein ecovery, but total dry matter reduction was reatest if no heat was applied. Protein yields were nproved if the waste was kept in motion during oc formation. Ferric chloride compared vorably with hydrogen chloride as a coagulant r protein precipitation. An estimated 30-40% of e crude protein and 80-90% of the coagulable rotein which is presently being wasted appears to e recoverable. (Kreager-FIRL)
/77-01991

EW DEVELOPMENTS IN UTILIZATION OF ASTES FROM FOOD INDUSTRY PLANTS.
ulletin of the Institution of Engineers (India), ol. 25, No. 10, p 58, April, 1976.

escriptors: *Food processing industry, Byproducts, *Water reuse, *Nutrients, Reclamation, Symbiosis, Nitrogen, Reverse os-osis, *Waste water treatment, Industrial wastes.

evelopments in the utilization of wastes from arious food industries are reported. Water ex-acts of lime mud, a waste product obtained in the roduction of protein hydrolysate, can be used as supplementary source of nitrogen in the produc-on of yeast. The reflux obtained during the roduction of citric acid can be added to molasses naximum dose of 100% in relation to the olasses) to increase the yield of yeast used for ommerical bakery purposes by some 8%. Ap-roximately 70 kilograms of commercial yeast can e obtained from 1 ton of post citric acid reflux. everse osmosis can be used to reclaim concen-ated waste water generated by yeast prodcution lants. (Kreager-FIRL)
/77-01992

ISTILLERY WASTES AS FERTILIZER.
ulletin of the Institution of Engineers (India), ol. 25, No. 10, p 50, April, 1976.

escriptors: *Food processing industry, *Water euse, *Waste water disposal, *Fertilizers, Nutrients, Agriculture, Irrigation, Nitrogen, hosphorus, Potassium, Biochemical oxygen de-and, Byproducts.
dentifiers: *Distillery wastes.

he use of distillery waste water for the fertiliza-on and irrigation of cane crops is discussed. Its se in this context simply requires proper dilution, nd cane crops irrigated by the diluted effluent equire no additional fertilizer over the entire cul-vation period. A mixed fertilizer with a nitrogen: phosphorus: potassium ratio of 12:5:3.5 can be obtained by mixing in 2:1:1 (by weight) proportions of the following ingredients: dry solids of distillery effluent, bone meal or single superphosphate, and urea or ammonium sulfate. The characteristics of the distillery effluent should be: pH 3.0-5.4, total solids 0.16-10.4%, ash 0.02-2.2%, potash 0.13-0.72%, biochemical oxygen demand 10,000-73,000 mg/liter, phosphorus 0.1-1.0%, and nitrogen 0.01-1.5%. (Kreager-FIRL)
W77-01993

VISCOUS PRODUCT FROM ACTIVATED SLUDGE BY METHANOL FERMENTATION,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
E. N. Davis, and L. L. Wallen.
Applied and Environmental Microbiology, Vol. 32, No. 2, p 303-305, August, 1976. 1 tab, 9 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Sludge treatment, *Food processing industry, *Reclamation, *Beneficiation, Alcohols, Microorganisms, Physical properties, Chemical properties, Byproducts, Agriculture, Domestic waste, Industrial waste.
Identifiers: *Methanol fermentation.

The aeration of activated sludge generated from a waste disposal plant handling mixed domestic and industrial (mostly agribusiness) wastes with 3-4% methanol additions for 5-7 days yielded an odorless, highly viscous (5000-10,000 centipoise), black, pudding-like product containing glycans linked other than alpha-1-4 or beta-1-3. Backseeding gave maximum thickening in 3-4 days. Incomplete acid hydrolysis of the black product gave a 0.27% solution of reducing sugars (75% glucose) which amounted to an 11.4% yield from the added methanol. Backseeding into either centrifuge supernatant or 0.1% yeast extract in tap water gave a light-colored polymer. Viscosity decreased during extended sterile cold storage. A 5% salt addition lowered viscosity by one-half. From 6-12 colony types appeared on plating backseeded media, but none of these isolates was a reliable polymer former. The beneficiated activated sludge may have other value besides its use as a source of methane fuel in anaerobic digesters. Such potential uses include: glucose recovery, the incorporation of a dried film of the sludge with pesticides for their slow release, and the coating of seedling roots to prevent dehydration. (Kreager-FIRL)
W77-01994

REMOVAL OF POTASSIUM FROM SUGAR INDUSTRY BY-PRODUCTS.
German Patent DS 1692-451. Issued July 29, 1976. Derwent German Patents Abstracts, Vol. X, No. 32, p C1, July 29, 1976.

Descriptors: *Food processing industry, *Waste water treatment, *Byproducts, *Separation techniques, *Potassium, Reclamation, *Patents, Recycling.

A patent for a process to remove potassium from water liquors generated by yeast production so that the liquors can be used in animal fodders is descsribed. The concentrated molasses is treated with excess sulfate or sulfuric acid at 70-75C; and on cooling to 30C over a 10-hour period, potassium sulfate crystallizes out and is removed by filtration or centrifugation. (Kreager-FIRL)
W77-01995

STEEL-PLANT STACKGAS CLEANUP: AN ATTRACTIVE ROLE FOR MAGNETISM,
L. J. Ricci.
Chemical Engineering, Vol. 83, No. 19, p 114, 116, September 13, 1976. 2 fig, 2 ref.

Descriptors: *Gases, *Metals, *Waste treatment, *Magnetic studies, *Separation techniques, Mineral industry, Waste water treatment, Solid wastes, Phosphates, Oil wastes, Dusts, Efficiencies, Pilot plants, Industrial wastes.
Identifiers: Magnetic separation.

The potential of high-gradient magnetic separation for removing magnetic materials from basic oxygen furnace stack gas is discussed. The magnetic separator device consists of a canister packed with fibers of a ferromagnetic material. The housing is subjected to a strong external magnetic field, and magnetic forces produced at the fibers' edges capture micron-size paramagnetic particles flowing counter-currently to the field. Overall collection efficiency varies with magnetic field, fiber diameter, packing density, mesh, length and magnetization, particle magnetic susceptibility and diameter, and gas viscosity and superficial velocity. Collection efficiencies better than 90% can be achieved for basic oxygen furnace dusts at particle sizes down to about 0.3-0.4 micron. Other possible applications include: cleaning steel mill and electroplating waste waters, removing particles from oils and hydraulic fluids, coal desulfurization, and the removal of solids and dissolved orthophosphates from municipal waste water. An Environmental Protection Agency sponsored pilot project involving the use of high-gradient magnetic separation for stack gas cleanup is currently underway, and commercialization could take place in the early 1980's. (Kreager-FIRL)
W77-01996

REMOVAL OF HEAVY METALS FROM INDUSTRIAL EFFLUENTS,
National Enforcement Investigations Center, Denver, Colo.
J. V. Rouse.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE5, p 929-936, October, 1976. 1 fig, 2 tab, 14 ref.

Descriptors: *Heavy metals, *Neutralization, *Sorption, *Chemical precipitation, *Ion exchange, *Reverse osmosis, Separation techniques, Industrial wastes, Chemical wastes, *Waste water treatment.
Identifiers: Cementation.

Techniques for the removal of heavy metals from industrial effluents are reviewed. Neutralization is the most widely used technique for removing dissolved heavy metals. The substance used for neutralization varies and can include lime, ground or crusted limestone, caustic, soda ash, or anhydrous ammonia. Heavy metals removal can also be achieved by sulfide precipitation, utilizing either inorganic sulfide, hydrogen sulfide gas or sulfide generated by anaerobic organic activity. Sorption techniques, utilizing either prepared sorption media for recovery and reuse or low-cost absorption media for single use, can also be used for heavy metal recovery. A recently patented system for metals removal in the fabric dyeing industry uses a prepared belt of peat. Cementation, a process widely used in the copper mining industry where dissolved copper is removed from solution by exchange with iron, offers a means of substituting a less toxic metal for a more toxic one. Reverse osmosis and ion exchange are attractive where water quality requirements dictate high quality effluent or in cases where there is a market for a high quality water for use as process or potable water. Coprecipitation is especially effective for radium removal; the principle involved in this case is the precipitation of barium sulfate with the coprecipitation of radium sulfate. (Kreager-FIRL)
W77-01997

FOAMY COMPLEX FORMATION FOR REMOVING AND RECOVERING OF HEAVY METAL IONS IN DILUTE SOLUTIONS WITH N-MONODECANOYL DIETHYLENETRIAMINE,
Government Industrial Research Inst., Nagoya (Japan).
G. Izumi, M. Sato, S. Shoji, and K. Oikawa.

Bulletin of the Chemical Society of Japan, Vol. 49, No. 7, p 1727-1731, July, 1976. 9 fig, 4 tab, 9 ref.

Descriptors: *Heavy metals, *Separation techniques, *Foam separation, *Waste water treatment, *Industrial wastes, Zinc, Cadmium, Copper, Lead, Iron, Metals.

A modified foam separating technique using the fatty compound N-monodecanoyl diethylenetriamine is described for the selective removal of various heavy metals from waste water. The fatty agent forms soluble and foamy complexes with the metals, thus allowing for their separation from aqueous media. The addition of 200 ppm of the fatty compound to a mixed solution of copper sulfate, lead nitrate, and zinc sulfate (equivalent to a mixture of 10 ppm of each metal ion) followed by foam treatment at various pH values resulted in a nearly 100% separation of copper ions at pH 6, 70% lead ions at pH 7, and about 98% zinc ions at pH 9. Foam treatment beginning at pH 9 resulted in the simultaneous recovery of more than 96% of all heavy metal ions. Tests with real waste water demonstrated the successful removal of zinc, cadmium, copper, lead, and iron. Electrolysis can be used to regenerate the fatty compound after its complexation with the metals to be removed. (Kreager-FIRL)
W77-01998

ELECTROCHEMISTRY,
Southampton Univ. (England). Dept. of Physical Chemistry.
G. Hills.
Chemistry in Britain, Vol. 12, No. 9, p 291-293, September, 1976. 6 fig, 4 ref.

Descriptors: *Electrochemistry, *Electrodialysis, *Electrodes, *Waste water treatment, *Desalination, Heavy metals, Organic compounds, Ion exchange, Brackish water, Industrial wastes, Chemical wastes, Liquid wastes, Adsorption, Inorganic compounds, Salts.
Identifiers: Pyridine.

The use of three-dimensional packed bed electrodes for the removal of inorganic and organic compounds from aqueous solutions is discussed. An electrochemical cell with a porous carbon granule electrode whose potential with respect to the solution can be made sufficiently cathodic so as to electroplate out a wide range of toxic heavy metal ions is illustrated. Removal efficiencies of greater than 99% are possible. Metals deposited onto the carbon bed can be rapidly unloaded by reversing the polarity of the bed. Dissolved organic materials can be adsorbed and desorbed from a graphite electrode by alternating the electrode potential from the potential of zero charge to either anodic or cathodic extremes. Using solutions of pyridine (40 ppm) in dilute aqueous potassium chloride, an adsorption efficiency of nearly 100% was initially achieved; however, it steadily declined as the graphite surface became saturated. A combination of electrodialysis and mixed bed ion-exchange is illustrated for the desalination of brackish water. The resin bed, whether packed or fluidized, maintains the conductivity of the electrodialysis cell even when the concentration of the influent solution falls to 10 ppm. (Kreager-FIRL)
W77-01999

THE EFFECT OF GAMMA IRRADIATION ON PULP AND PAPER MILL EFFLUENTS,
Tokyo Univ. (Japan). Dept. of Forest Products.
G. Meshitsuka, and J. Nakano.
Applied Polymer Symposium, No. 28, p 1321-1330, 1976. 10 fig, 9 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Waste water treatment, *Lignins, *Degradation(Decomposition), *Gamma rays, Radiation, Waste treatment, Effluents, Color, Dissolved oxygen, Aeration, Bubbles, Chemical oxygen demand, Industrial wastes, Chemical wastes.

The effect of gamma irradiation on the decomposition of lignin in pulp and paper mill effluents was investigated using lignosulfonate, thiolignin, and various kraft mill effluents. Irradiation was performed with gamma rays from cobalt 60 sources of 12,000 and 17,000 curies. Gamma irradiation in combination with air bubbling (dissolved oxygen) resulted in the radiolytic degradation of the aromatic nucleus of the lignin molecule. The addition of small amounts of alcohols, sodium acetate, and peroxides accelerated the radiolytic brightening of lignin, whereas iron addition had a detrimental effect. Studies with kraft mill effluents revealed that gamma irradiation, even without air bubbling, was effective in reducing the chemical oxygen demand and color content of both the chlorine stage and the total effluent. However, for the caustic extraction stage effluent, air bubbling was found indispensable for complete decoloration and chemical oxygen demand decrease. Color removal and chemical oxygen demand decrease were difficult to achieve in the screen washing effluent even when air bubbling was used. (Kreager-FIRL)
W77-02000

CONTINUOUS TREATMENT OF WOOL WASH LIQUID - EFFICIENCY INCREASED BY SUPPLEMENTARY CLOSED CONTAMINANT TREATMENT CIRCUIT LINKED TO LIQUID CLEANING CIRCUIT.
Soviet Patent SU-481-550. Issued January 16, 1976. Derwent Soviet Inventions Illustrated, Vol. X, No. 34, p D5, September 29, 1976. 1 fig.

Descriptors: *Patents, *Textiles, *Waste water treatment, *Industrial wastes, *Separation techniques, Filtration, Filters, Cyclones, Heat exchangers, Heat transfer, Liquid wastes, Efficiencies, Water reuse, Recycling.
Identifiers: Textile industry.

A patent for an apparatus that continuously treats wool wash liquid is described that utilizes a supplementary closed contaminant treatment circuit to increase efficiency and bulk. The closed cleaning system consists of a series of filters, hydrocyclones, heat exchangers, a thermal drier, and conveyors. A supplementary closed contaminant treatment and vapor generation circuit which consists of a worm mixer, the thermal drier, and the conveyor is connected to the liquid cleaning circuit by a drier, with the discharge being connected to the worm mixer and the receiving part to the hydrocyclone. The steam generating circuit consists of a series arrangement of the gas-steam separator, a condenser, the thermal jacket of the hydrocyclone, and the worm heat exchanger connected to the thermal drier. (Kreager-FIRL)
W77-02002

REMOVING POLYVINYL ALCOHOL FROM TEXTILE FINISHING WASTE WATER - BY ADDING A BINDER, E.G., A SALT OR FORMALDEHYDE, TO INSOLUBILISE THE POLYMER.
Belgian Patent BE-839-217. Issued July 1, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 31, p D2, September 8, 1976.

Descriptors: *Patents, *Textiles, *Alcohols, *Waste water treatment, *Separation techniques, Solubility, Chemical wastes, Liquid wastes, Industrial wastes, Polymers, Binders, Efficiencies.
Identifiers: Polyvinyl alcohol, Textile industry.

A patent for a process that removes polyvinyl alcohol as a solid and insoluble product from textile finishing waste water is described. The process involves adding a binder to the liquid waste in order to make the polyvinyl alcohol insoluble. The binder is preferably any of the following: ammonium sulfate, anhydrous sodium carbonate, borax, formalin, or a salt solution. The patent claims four different embodiments of the process. The treatment process results in 100% polyvinyl alcohol recovery without sludge formation. (Kreager-FIRL)
W77-02003

LONG-TERM BIODEGRADABILITY OF TEXTILE CHEMICALS,
Clemson Univ., S.C. Dept. of Textiles.
J. J. Porter, and E. H. Snider.
Journal Water Pollution Control Federation, Vo 48, No. 9, p 2198-2210, September, 1976. 18 fig, 1 ref.

Descriptors: *Textiles, *Biodegradatio *Biological treatment, *Waste water treatmen *Industrial wastes, *Chemical wastes, Biochem cal oxygen demand, Chemical oxygen deman Dyes, Solvents, Degradation(Decomposition Performance, Chemical reactions, Effluent Evaluation, Organic compounds
Identifiers: Kerosene, Textile industry, Texti finishes, Textile sizings.

Data from 30-day biochemical oxygen demand st dies of several textile chemicals (hydrocarbon so vents, dyes, textile finishes, and sizings) are r ported and compared with the chemical oxyg demand of the sample. The data indicate that ma textile chemicals degrade slowly and continue consume oxygen after 30 days, thus, a 5-d biochemical oxygen demand test cannot be used measure the ultimate biochemical oxygen dema of such chemicals and should be coupled with t chemical oxygen demand test so that the total c ganics in the waste will be measured and compar with the fraction that is degradable. The fact th kerosene, for example, has 5-day and 30-d biochemical oxygen demands of 13,000 and 28,0 mg/liter is evidence of its poor degradability wh compared with the chemical oxygen dema requirement of 2.5 million mg/liter. Many dyes a also resistant to degradation and show little co change after 30 days. If the fraction of organi that is degraded in 5 days is low, an assessment the treatment system should be made to see physical or chemical treatment methods can utilized more efficiently than biological wa treatment. (Kreager-FIRL)
W77-02004

LAUNDERING AND DRY-CLEANING,
N. S. Whittall.
In: Textile Progress, Vol. 8, No. 2, p 1, 22-1976.

Descriptors: *Laundering, *Waste water tre ment, *Reclaimed water, *Water reu *Industrial wastes, Liquid wastes, Recycli Symbiosis, Reclamation, Oxidation, Organic co pounds, Filtration, Treatment facilities, Aerati Heat exchangers, Heat transfer, Effluents.

A system for reclaiming laundry effluent described. Used water from the washers flo over a heat reclaimer made of copper coils and cooled water then enters a settling tank via a se of filters which remove large insoluble mat Sump pumps circulate the water through diffus devices where it is subjected to air for oxidation organic matter. The aerated water then pas through additional filtration chambers and finally pumped back through the heat reclaime the main hot water tanks. Thus, the volume water discharges is reduced, heat is recover and the quality of the effluent is improv (Kreager-FIRL)
W77-02005

TREATING WASTES FROM E.G., SLAUGHT HOUSES, TANNERIES - BY PASSI THROUGH ELECTROLYTICALLY PRODUC FINE BUBBLES INTO FLOTATION TANK.
French Patent FR 2287-422. Issued June 11, 19 Derwent French Patents Abstracts, Vol. X, 30, p D4, May 7, 1976.

Descriptors: *Patents, *Tannery wastes, *Wa water treatment, *Separation techniq

*Bubbles, *Flotation, Electrolysis, Chemical wastes, Industrial wastes, Aggregates.
Identifiers: Slaughterhouse wastes, Tanneries.

A patent for a process which treats industrial wastes from tanneries and slaughterhouses is described. The waste is passed through a compact and dense zone of fine bubbles which are produced electrolytically. The aggregates formed by the bubbles and waste are directed into a flotation tank where the aggregates rise to the surface and are separated. This produces extremetly fine bubbles and very active seed floccules consisting of bubbles adhering to waste particles. (Kreager-FIRL)
W77-02007

ON SPENT LIQUOR OF SEMICHEMICAL PULPING (V). IMPROVEMENT OF THE COLOR REMOVAL EFFICIENCY BY THE PHOTOCHEMICAL TREATMENT (SCP HAIEKI NI TSUITE (V). SHIGAISEN SHORI NI OKERU SHOSHA KORITSU NO KOJO),
S. Meguro, K. Sameshima, M. Sumimoto, and T. Kondo.
Kamipa Gikyoshi (Japan Tappi), Vol. 30, No. 8, p 444-449, August, 1976. 6 fig, 1 tab, 8 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Color, *Ultraviolet radiation, *Waste water treatment, *Oxygenation, Temperature, Chemical wastes, Acidity, Alkalinity, Additives, Chemical oxygen demand, Efficiencies, Industrial wastes.

Factors affecting the efficiency of ultraviolet radiation-induced color removal from spent liquor generated during semichemial pulping were investigated. The photochemical efficiency of color removal was increased by oxygen- and air-bubbling and changes in pH and temperature. Oxygen bubbling exerted the strongest influence of color removal efficiency. A color removal of 90% and a chemical oxygen demand decrease of 40% were accomplished when irradiation was carried out at a pH of 12 and a temperature of 60 C along with oxygen bubbling for about 2 hours. The use of chemical additives to increase color removal efficiency at room temperature and at acidic and alkaline pH values was also investigated. The addition of 25 ppm of rose bengal and periodate at pH values of 2 and 5 resulted in a 90% color removal; the addition of acetyl acetone and hydrogen perodide at a pH of 5 also resulted in color removals of 90%. See also W76-09338; W74-09454; and W73-15189) (Kreager-FIRL)
W77-02008

STORMWATER STUDIES AND ALTERNATIVES IN ATLANTA,
Jordan, Jones, and Goulding, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W77-02073

5E. Ultimate Disposal Of Wastes

HYGIENIC EVALUATION OF THE STATE OF PROTECTION OF A WATER BODY FROM POLLUTION IN THE REGION OF AN INDUSTRIAL COMPLEX, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W77-01555

MUNICH'S CONTRIBUTIONS TO SEWAGE, FISHERY AND STREAM BIOLOGY, VOL. 26. WATER FOR LAND RECLAMATION AREAS, (IN GERMAN),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
For primary bibliographic entry see Field 5D.
W77-01598

DEWATERING OF ACTIVATED SLUDGE WITH FILTER BELT PRESSES,
Alton Box Board Co., Jacksonville, Fla.
For primary bibliographic entry see Field 5D.
W77-01651

CONSIDERATIONS FOR LAND DISPOSAL OF PAPER AND PULP MILL SLUDGE,
W. M. Perpich.
Tappi, Vol. 59, No. 9, p 56-57, September, 1976. 4 ref.

Descriptors: *Sludge disposal, *Pulp and paper industry, *Landfills, Solid wastes, Sludge, Physical properties, Chemical properties, Leachate, Geology, Hydrogeology, Land use, *Waste disposal, Ultimate disposal.

Considerations for disposal of pulp and paper mill sludge by landfilling which are discussed include a knowledge of the physical and chemical characteristics of the sludge, a leachate study of the sludge, knowledge of the geological and hydrogeological features of the proposed landfill site, and a final use plan for the site after abandonment. (Sykes-IPC)
W77-01654

DISPOSAL OF FLEXO INK WASHUP WASTE WATER,
For primary bibliographic entry see Field 5D.
W77-01670

METHOD OF PRODUCING CHAR FROM PULP MANUFACTURING WASTE LIQUOR,
Sanyo-Kokusaku Pulp Co. Ltd., Tokyo (Japan).
T. Norita, H. Ibara, M. Murakami, and M. Okano.
United States Patent No. 3,971,705. July 27, 1976, 5 p, 1 fig, 4 claims.

Descriptors: *Byproducts, *Patents, *Pulp wastes, *Activated carbon, Ultimate disposal, Carbon, Effluents, Water pollution sources, Wastes, Industrial wastes, Heat treatment.
Identifiers: *Destructive distillation, Paper, Paperboard.

A method of treating spent pulping liquors to form a carbonized solid of use in making activated carbon comprises confining the spent liquor in a container and feeding the container into an air-heating furnace so that the container is contacted countercurrently with heated air, without rotating or stirring the container or its contents, at 200-400C for over 30 minutes. The container may be made of paper or paperboard, in which case the container itself is carbonized during the process and becomes part of the carbonized solid product. (Lynch-IPC)
W77-01676

PLANNING FOR REGIONAL WASTE WATER SYSTEMS,
Massachusetts Dept. of Community Affairs, Boston.
For primary bibliographic entry see Field 5D.
W77-01690

REPORT OF RESEARCH AND RESEARCH NEEDS ON WATER QUALITY PROBLEMS IN THE STATE OF HAWAII,
For primary bibliographic entry see Field 5G.
W77-01698

METHOD AND APPARATUS FOR CONTROLLING THE DISCHARGE OF CONTAMINANTS FROM SHIPS,
For primary bibliographic entry see Field 5G.
W77-01732

DEWATERING PROCESS,
For primary bibliographic entry see Field 5D.
W77-01738

PROCEDURES MANUAL FOR MONITORING SOLID WASTE DISPOSAL SITES,
Wehran Engineering Corp., Middletown, N. Y.
For primary bibliographic entry see Field 5B.
W77-01774

A ROTATING FLIGHTED CYLINDER FOR SOLID-LIQUID SEPARATION AND BIOLOGICAL WASTE TREATMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-01815

DISPOSAL OF WASTEWATER RESIDUALS, (VOLUMES 1 AND 2).
Environmental Quality Systems, Inc., Rockville, Md.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 371, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/79, March 1976. 1,031 p.

Descriptors: *Sludge disposal, *Waste water disposal, *Waste treatment, Ultimate disposal, Waste disposal, *Waste water treatment, Incineration, Federal Water Pollution Control Act, Air pollution, Water pollution control, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An evaluation was made of the impact to the nation and 'minimum geographical areas' of the disposal of residues produced from wastewater treatment required to meet goals of Water Pollution Control Act Amendments of 1972 (P.L. 92-500). Land disposal of sludges and treated effluent were emphasized. Incineration and ocean disposal of sludges were also considered. Based on a review of residue production by treatment or manufacturing processes, municipal and industrial residue generation rates and locations were estimated. Impacts on natural vegetation, wildlife and groundwater were evaluated for land disposal techniques. Impacts on air quality were evaluated for incineration of sludge as well as air stripping for ammonia removal from sewage. Ocean disposal was considered both in general and with emphasis on the New York Bight. Local impacts of land disposal could be controlled and minimized with careful site selection and development and carefully controlled application rates. Incineration and air stripping systems can cause air pollution problems if not properly designed, located and operated. (NCWQ)
W77-01984

KODAK DISPOSES OF WASTE IN SYSTEM THAT HELPS PAY ITS WAY,
For primary bibliographic entry see Field 5D.
W77-01989

DISTILLERY WASTES AS FERTILIZER.
For primary bibliographic entry see Field 5D.
W77-01993

VISCOUS PRODUCT FROM ACTIVATED SLUDGE BY METHANOL FERMENTATION,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
For primary bibliographic entry see Field 5D.
W77-01994

A MODEL FOR CALCULATING EFFECTS OF LIQUID WASTE DISPOSAL IN DEEP SALINE AQUIFERS, PART I--DEVELOPMENT.
Geological Survey, Austin, Tex.

For primary bibliographic entry see Field 5B.
W77-02010

WASTEWATER STORAGE-SIMULATION OF INSTREAM EFFECTS,
Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort.
For primary bibliographic entry see Field 5B.
W77-02074

5F. Water Treatment and Quality Alteration

TRANSFORMATION OF CHEMICAL SUBSTANCES IN WATER BODIES AND DURING WATER TREATMENT AS A HYGIENIC PROBLEM, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
A. A. Korolev, and V. T. Mazaev.
Gig Sanit 7, p 83-88, 1975.

Descriptors: *Water treatment, *Chemical reactions, *Chemical degradation, Toxicity, Odor, Color, *Chemical properties, Public health, Food chains.

Transformation of a chemical substance in water reduces its concentration and changes its chemical nature; weakening or intensification of toxicity, disappearance or appearance of odor, taste and color, degradation or accumulation of the substance and its transformation products in water, even incorporation in food chains can result.
W77-01552

EFFECTIVENESS OF METHODS OF IMPROVING DRINKING WATER QUALITY (FLUORIDATION, DESALINATION, MAGNETIC TREATMENT, ETC., (IN RUSSIAN),
Meditsinskii Institut, Saratov (USSR).
E. V. Shtannikov.
Gig Sanit 7, p 25-29, 1975.

Descriptors: Potable water, *Fluoridation, Pesticides, *Desalination, Electrodialysis, *Pesticide removal, *Ion exchange, Human diseases, Hardness(Water), Separation techniques, Resins, *Water treatment.
Identifiers: Arthritis, Caries, Lithiasis, *USSR, *Magnetic treatment.

Fluoridated water is effective in dental caries prevention in children and adolescents in the USSR. Water desalinated by electrodialysis has no adverse effect on experimental animals or humans. People who consume highly mineralized hard water over long periods of time get arthritis, nephrolithiasis and cholecystolithiasis. Magnetic treatment of waters whose carbonate hardness amounts to more than half of the total hardness is effective. Water treated by a magnetic field with a strength of not more than 2000 Oersted is safe for the health of the population. The combined use of coagulants and flocculants with subsequent filtration of the treated water through sand is especially useful for inactivating pesticides. The use of ion-exchange resins can reduce the concentration of pesticides in water by 95-100%.
W77-01558

TREATMENT OF POTABLE WATER UNDER FIELD CONDITIONS. EXPERIENCE FROM THE SECOND WORLD WAR, (IN RUSSIAN),
T. I. Golubev.
Gig Sanit 5, p 22-24, 1975.

Descriptors: *Potable water, *Water treatment, *Coagulation, *Chlorination, Bioindicators, Bacteria.
Identifiers: Russian-SFSR, USSR, *Izhora River(USSR), *Leningrad(USSR).

Provision of troops with potable water during World War II from a water treatment plant in Kolpino on the Izhora River outside of Leningrad (Russian SFSR, USSR) is described. The entire water treatment process (coagulation and chlorination) was carried out simultaneously in the same vessel and the water could be used without filtration after appropriate settling. Physicochemical and bacteriological indices of the water from the Izhora River (on June 15, 1942) are given.--Copyright 1976, Biological Abstracts, Inc.
W77-01576

EFFECT OF ABATE (DIPHOS) ON THE GENERAL SANITARY CONDITIONS OF WATER BODIES: II, (IN RUSSIAN),
For primary bibliographic entry see Field 5D.
W77-01607

PLANNING FOR REGIONAL WASTE WATER SYSTEMS,
Massachusetts Dept. of Community Affairs, Boston.
For primary bibliographic entry see Field 5D.
W77-01690

PROCESS FOR PURIFYING TAP WATER,
I. V. Popov, G. R. Bochkarev, V. F. Lebedev, and F. A. Baryshnikov.
U.S. Patent No. 3,974,070, 5 p, 1 fig, 3 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 699, August 10, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Flocculation, Electrolysis, Filtration, Alkaline earth metals, Potable water, Water supply.

A process for purifying tap water comprises filtration of the water with impurities flocculated by a metal hydroxide produced electrolytically in the same water, through a layer of a solid water-insoluble granular material. The water containing a metal hydroxide is passed continuously through a layer of granular material in such a manner that metal hydroxide is deposited on the surface of the granular material in the direction of water flow forming an additional filtering layer. The metal hydroxide is an active flocculating agent for the finest disperse particles and possesses a high water-penetrating ability, so that the use of a metal hydroxide in the form of a water-penetrating layer having a high adsorption activity makes it possible to efficiently perform a continuous process of water purification.
W77-01726

WATER CONDITIONING DEVICE,
Marian Co., Chicago, Ill. (Assignee).
L. D. Dunn, and J. Shields.
U.S. Patent No. 3,974,071, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 699, August 10, 1976.

Descriptors: *Patents, *Scaling, *Corrosion control, *Water treatment, *Water quality control, Inhibitors, Alloys, Equipment.
Identifiers: *Water conditioning, Configuration.

The efficiency of a corrosion and lime scale inhibitor for use in a water conditioning device can be appreciably improved by providing the inhibitor with an improved configuration and by causing the inhibitor to churn the water as the water flows through the casing. Additionally, the inhibitor has a non-oxidized or 'machined' surface in lieu of the oxidized surface of a sand casting causing the activity of the inhibitor to be increased. The device uses a spirally twisted strip of corrosion and lime scale inhibiting copper-nickel alloy contained within a cylindrical casing through which the cold water is delivered. The spiral strip churns the water for more complete contact of the water with the strip surfaces as the water flows through the casing. (Sinah-OEIS)
W77-01727

METHOD OF DISINFECTING WATER,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (West Germany).
V. Eibl, and A. Reis.
U.S. Patent No. 3,975,246, 4 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1102, August 17, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Disinfection, Water quality control, *Electrolysis, Anodes, Cathodes, Membranes, Electrochemistry, Inorganic compounds, Chemical properties.

Microorganisms in water can be destroyed by electrolysis without impairing the taste of the water and without leaving in the water detectable traces of the chemicals employed during electrolysis. The water to be disinfected is supplied to the anode compartment of an electrolytic cell divided into an anode compartment and a cathode compartment by a membrane permeable to anions and having electrodes in the compartments. The cathode compartment is provided with an aqueous solution of a chloride, hydroxide, carbonate, or peroxide of an alkali metal, with hydrogen chloride, or with hydrogen peroxide in a concentration which exceeds the concentration of the same compound in the treated water. When direct current is passed between the anode and cathode through the cell the water withdrawn from the anode compartment shows a disinfecting effect greater than would be observed in the absence of the chemicals dissolved in the catholyte, and the chemicals cannot be detected in the withdrawn, treated water by any change in the taste of the water. The anode and cathode compartments may be separated by an membrane permeable to anions, but fastest disinfection has been achieved with a membrane practically impermeable to cations. (Sinha-OEIS)
W77-01734

LIQUID TREATING SYSTEM,
H. H. Wendel.
U.S. Patent No. 3,975,267, 6 p, 3 tab, 4 ref; Official Gazette of the United States Patent Office Vol 949, No 3, p 1108-1109, August 17, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Demineralization, *Ion exchange, *Water quality control, *Resins, Separation techniques, Anion exchange, Cation exchange, Pressure.
Identifiers: Regeneration.

The object of the invention is to provide a purification and demineralizing system for treating water where the quality of the water is maintained for long periods of time and where the expansion of ion exchange resins during regeneration is minimized but which leaves the resins in an expanded or soft bed state. A water purification system can be made much more efficient if the regeneration solutions or liquids and the rinse solutions all contact the ion-exchange resin when under a pressure of at least psi and preferably at least 30 to 60 psi or higher. It is disclosed that exhausted treating material is more efficiently regenerated if the regeneration solution is first used in a dilute solution and the concentration gradually increased until the treating material is substantially and completely regenerated. The regeneration solution is passed through the treating material in a direction opposite to that of the treated water. Any type of anion exchange resin can be utilized however it is preferable if the anion exchange resin in the hydroxyl form. It is also preferred that a stratified bed be utilized. (Sinha-OEIS)
W77-01739

PROCESS FOR STERILIZING WATER BY THE COMBINATION OF CHLORINE AND ANOTHER HALOGEN,
B. Saunier, and A. Derreumaux.

U.S. Patent No. 3,975,271, 9 p, 6 fig, 4 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1110, August 17, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Disinfection, Water quality control, *Chlorination, Halogens, *Bromine, *Iodine, Chlorine.

The process consists essentially in preparing in a reactor a mixture of chlorine and of bromide and/or iodide, in such molar ratios, pH and temperature condition that free bromine and/or free iodine released, and in subsequently feeding the reacted mixture into the water to be treated efficiently sterilizing the water. It makes it possible to deal with possible contamination in the system, and above all, does not deteriorate the organoleptic properties of the water. The bormamines which possibly form have the advantage of having no disagreeable taste or smell and have a disinfecting action much greater than that of the chloramine. The halogen content in the mixture is sufficient to provide for both the oxidation of the nitrogenous matter contained in the effluent and a residual halogen content which enables satisfactory disinfection to be achieved. The disinfection or sterilization processing may be carried out upstream or downstream of any other treatment which might be necessary for other purposes such as filtration, decantation and even prechloration. (Sinha-OEIS)
W77-01742

ION EXCHANGE REGENERATION,
Nalco Chemical Co., Oak Brook, Ill. (Assignee).
K. Odland.
U.S. Patent No. 3,977,968, 7 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 5, p 2025, August 31, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Water softening, *Ion exchange, Zeolites, Inorganic compounds, Waste water treatment.
Identifiers: Regeneration.

A process for the regeneration of a column of an exhausted sodium zeolite softener comprises feeding an excess of substantially pure soft sodium chloride brine at a concentration of about 8-12% as input regenerating liquid and removing from the zeolite column a hard brine containing substantial amounts of alkaline earth metal values. The total volume of regenerative liquid is adjusted so that the alkaline earth metal values have a maximum value of about 16,000 ppm so as to avoid the formation of a gelatinous product and further precipitation of the alkaline earth metals is by utilizing sodium carbonate and sodium hydroxide, removing the calcium and magnesium precipitates formed and adjusting the pH of the treated liquid to produce a softened brine suitable for recycle as regenerating liquid. (Sinha-OEIS)
W77-01748

DOUBLE-FLOW MAGNETIC FILTER, APPARATUS AND METHOD,
Kraftwerk Union A.G., Muelheim an der Ruhr (West Germany). (Assignee).
H. G. Heitmann, and M. Schott.
U.S. Patent No. 3,979,288, 5 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 263, September 7, 1976.

Descriptors: *Patents, *Water treatment, *Water pollution treatment, Water pollution control, Water purification, *Filtration, Powerplants, Electric fields, *Filters.
Identifiers: *Electromagnetic filters, Ferromagnetic impurities.

An electromagnetic filter is comprised of an elongated vertically disposed vessel through which the impure water transverses. A charge of magnetizible ball-like pellets are in the vessel and an electric coil coaxially surrounds the vessel. The coil is electrically energised to produce a magnetic field. Rinsing water is supplied from the lower end of the vessel and discharged from the upper end. Passages having a multiplicity of openings are distributed over the cross-section of the vessel. This electromagnetic filter permits greater flowthrough rates for relatively limited rinsing water demand without allowing nonuniformities or irregularities in the magnetic field and high stray magnetic fields to occur due to a disadvantageous dimension ratio of the coil diameter to the coil height. Such double-flow filters can be installed in steam powerplants heated with fossil fuels or in nuclear powerplants to remove ferromagnetic impurities in feed water. (Sinha-OEIS)
W77-01758

DISEASE RISKS OF OCCUPATIONAL EXPOSURE TO SEWAGE,
Cincinnati Univ., Ohio. Environmental Health Engineering.
For primary bibliographic entry see Field 5C.
W77-01877

WATER POLLUTION CONTROL ACT OF 1972, COSTS AND CAPABILITIES, WATER TREATMENT SYSTEMS,
American Water Works Association Denver, Colo.
For primary bibliographic entry see Field 5D.
W77-01963

HYGIENIC PROBLEMS OF FORECASTING THE QUALITY OF WATER RESOURCES, (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W77-02071

5G. Water Quality Control

SIGNIFICANCE OF HYGIENIC INVESTIGATIONS IN SOLVING PROBLEMS OF PROTECTING SURFACE WATERS AT THE CURRENT STAGE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
V. A. Savelova, and R. I. Khalitov.
Gig Sanit 7, p 10-12, 1975.

Descriptors: Public health, Surface waters, Industrial wastes, Water quality control, Runoff, Interbasin transfers, River flow, Diversion, Regulation.

The sanitary state of surface waters, maximum allowable concentrations of common industrial wastewater constituents, water quality control and regulation, diversion and interbasin transfer of river runoff are discussed.
W77-01553

HYGIENIC ASPECTS OF THE CENTRAL WATER HEATING, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
S. N. Cherkinskii, L. N. Gabrilevskaya, and Z. V. Levashova.
Gig Sanit 7, p 7-10, 1975.

Descriptors: *Water supply, *Heated water, Public health, *Water quality standards.
Identifiers: *USSR.

Central hot water supply in the USSR is an important hygienic factor. Open and closed systems are distinguished. Judging by the quality and safety of hot water only the closed systems meet the hygienic requirements.
W77-01559

FORMATION OF WATER QUALITY BY AQUATIC ORGANISMS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
M. M. Boichenko.
Biol Nauki (Mosc) 18(4), p 74-77, 1972.

Descriptors: Water quality, Aquatic animals, Self purification, *Biological treatment, Algae, Organic matter, *Waste water treatment.
Identifiers: *Biological post-treatment, Oscillatoria-spendida.

During self-purification, waters are enriched with metabolitis and restored to biological soundness. Physicochemical regeneration of water should be accompanied by biological aftertreatment. Dissolved organic matter in natural waters was studied to determine the most reactive fraction. lipids and essential fat-soluble vitamins. Enrichment of water with organic and mineral components during its physicochemical regeneration from urine with the aid of an algological polyinoculant containing mainly the blue-green alga Oscillatoria spendida was studied. Addition of the polyinoculant caused the composition of the lipid fraction of dissolved organic matter to become analogous to that in natural waters. The activity of the aquatic organisms gave the regenerated water full biological value. Biological after-treatment is necessary in physicochemical regeneration of water.
W77-01561

EVALUATION OF THE SELF-PURIFYING ABILITY OF WATERS OF THE LOWER DON, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
L. S. Soloveikina.
Izv Sev-Kavk Nauchn Tsentra Vyssh Shk Estestv Nauki, 3(1), p 97-100, 1975.

Descriptors: *Self purification, Temperature, Water pollution, Velocity, Oil wastes, *Oil pollution, *Phenols, Industrial wastes.
Identifiers: *Lower Don River(USSR), Azov Sea.

Self-purification of the waters of the Lower Don River (USSR) was evaluated with respect to the removal of individual nonconservative pollutants (petroleum products, syndets, phenols). The effects of temperature, stream velocity, water discharges and degree of pollution were determined. Self-purification of the Lower Don is insufficient to mineralize the pollutants before they enter the Azov Sea.
W77-01569

DETERMINATION OF ESTIMATED MAXIMUM PERMISSIBLE AND MAXIMUM RESIDUAL CONCENTRATIONS OF PESTICIDES IN ENVIRONMENTAL OBJECTS, BASED ON THE PRINCIPLES OF COMPLEX (INTEGRAL) STANDARDIZATION, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
K. K. Vrochinskii.
Gig Tr Prof Zabol 12, p 31-34, 1974.

Descriptors: *Pesticides residues, *Pollutant identification, *Water quality standards, *Public health, Water pollution control, Air pollution.
Identifiers: *Maximum permissible concentration(Pesticides).

Considering the integrated action of residual pesticides in food products, water and air on humans, the principle of a complex hygienic standardization is applicable. For objects that have no empirically established hygienic standards and also in the case of substances for which maximal permissible concentration (MPC) rates were set experimentally at an earlier date, tentative MPC are estimated. For substances with previously established MPC's it was possible to compare the estimated

and experimental MPC; the standard and experimental values agreed in more than 50% of the cases. The estimated MPC may be used in the practice of sanitary inspection as tentative values and should be further corrected through experimental investigations.--Copyright 1976, Biological Abstracts, Inc.
W77-01575

USE OF PUNCH CARDS FOR ACCUMULATING AND ANALYZING DATA ON THE SANITARY-EPIDEMIOLOGICAL STATE OF RURAL POPULATED AREAS, (IN RUSSIAN),
V. V. Kolodkin, and V. I. Nashivankin.
Gig Sanit 6, p 40-41, 1975.

Descriptors: *Data storage and retrieval, *Rural areas, *Public health, *Epidemiology, Human population, Human diseases.

A punch-card information retrieval system for accumulating and analyzing data on the sanitary and epidemiological state of rural populated areas is described. The card contains 35 descriptions, such as the population size and number of homeowners, preschool institutes and schools, food stores and public eating establishments, livestock farms, public and individual baths, barbershops, sewerage, use of wastes for fertilizing soils, water supply, infectious diseases, etc.
W77-01600

SOME PROBLEMS OF ENVIRONMENTAL PROTECTION IN CONNECTION WITH THE DEVELOPMENT OF NONFERROUS METALLURGY IN THE NORTH CAUCASUS, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
N. G. Zaiva.
Izv Sev-Kavk Nauchn Tsentra Vyssh Shk Estestv Nauki 3(1), p 100-102, 1975.

Descriptors: *Industrial wastes, *Water consumption, *Recycling, *Water conservation, Technology, *Water reuse, Water pollution.
Identifiers: Nonferrous metallurgy plants, *USSR(North Caucasus).

The adverse environmental effects of various waste of nonferrous metallurgy plants in the North Caucasus (USSR) and the possibility of the more rational use of raw materials and wastes to reduce their undesirable environmental effects are discussed. Modern concentration processes based on concentration processes based on considerable water consumption pollute with wastewaters; imperfect technology leads to the loss of valuable components (e.g., Ag, Au, Cu) in wastes. A more effective technology is desirable and will be beneficial to industry and the environment.
W77-01605

SIGNIFICANCE OF SUSPENDED LOAD AND BOTTOM DEPOSITS IN SELF-PURIFICATION OF THE SELENGA RIVER FROM PETROLEUM PRODUCTS, (IN RUSSIAN),
Limnologicheskii Institut, Irkutsk (USSR).
V. Ya. Zyul'Kina.
Gidrobiol Zh 11(3), p 63-65, 1975.

Descriptors: *Self purification, *Oil pollution, Oil wastes, *Chromatography, Fluorescence, *Pollutant identification, *Bottom sediments, Lakes, Industrial wastes, Rivers, Asia.
Identifiers: River Selenga(USSR), Lake Baikal(USSR).

Fluorescence chromatography showed that the petroleum products sorbed by the suspended load of the Selenga River, a major tributary of Lake Baikal, USSR, are composed of a mixture of solar oil and fuel oil. Much of the suspended load is composed of montmorillonite having a high absorption capacity. Entering the river, the petroleum products also pollute the bottom deposits. With distance from the Selenga delta their content in the bottom deposits of Lake Baikal decreases. One gram of suspended solids and bottom deposits sorbs up to 12-25 mg solar oil.
W77-01606

WASTE WATER CONTROL -- DEMONSTRATED FOR A RIVER PROFILE (ABWASSERKONTROLLE -- DEMONSTRIERT AN EINEM FLUSSPROFIL),
Leykam-Muerztaler A. G., Gratkorn (Austria).
For primary bibliographic entry see Field 5B.
W77-01648

ANNUAL BOOK OF ASTM STANDARDS. PART 31: WATER,
For primary bibliographic entry see Field 5A.
W77-01662

A STUDY TO DEFINE CHANGES IN PULP MILL EFFLUENT-CONTRIBUTED COLOR IN RECEIVING WATERS DETECTABLE BY HUMAN OBSERVERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5A.
W77-01677

1975 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W77-01678

THE INFLUENCE OF TRICKLE IRRIGATION ON THE QUALITY OF IRRIGATION RETURN FLOW,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
K. W. Brown, C. J. Gerard, D. W. DeMichele, P. J. H. Sharpe, and B. W. Hipp.
Texas Water Resources Institute, College Station, Completion Report TR-70, March, 1976. 77 p, 19 tab, 38 fig, 10 ref. OWRT B-156-TEX(1), 14-31-0001-4128.

Descriptors: Water quality, *Leachate, Leaching, Sorghum, *Rio Grande River, *Return flow, *Texas, Nitrates, *Lysimeters, *Salt balances, *Computer models, Simulation analysis, Soil treatment, Crop production, Irrigation water.
Identifiers: *Trickle irrigation, Lower Rio Grande Valley(Tex).

The influence of trickle irrigation on the quality of irrigation return flow was investigated in a field study and by means of computer simulation models. Six undisturbed buried monolith lysimeters were utilized to quantify the leachate from treatment including two different qualities of irrigation water applied through a trickle irrigation system. Both moisture and salt balances were followed inside and outside the lysimeters during a growing season the remainder of the calendar year. A sorghum crop was grown on the lysimeters and in the adjacent area. Irrigation was scheduled based on pan evaporation losses. The irrigation water of high salt content was obtained from a deep well while the irrigation water of low salt content was drawn from the district irrigation canal. The water balance monitored by the neutron probe showed that differences between inside and outside lysimeters were small. The soil contained significant amounts of salt at the beginning of the experiment and trends in the leachate concentration resulting from irrigation treatment are difficult to see after one year of monitoring. Differences between paired lysimeters are large indicating large variability in soil characteristics across the field. Differences in water use inside and outside the lysimeters indicated that during the 1974 growing season, which was dryer than normal, the sorghum crop may have extracted approximately 8% of the water required from the water table. Yield and growth data indicated that the plant root environments inside and outside lysimeters were relatively comparable. Nitrogen, saline water and irrigation treatments did not significantly influence growth and yields of sorghum in 1974.
W77-01680

RESEARCH NEEDS FOR THE LAKE TAHOE BASIN,
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, Calif.
For primary bibliographic entry see Field 6G.
W77-01693

CONNECTICUT RIVER BASIN PROGRAM PHASE II. WATER QUALITY IMPACT EVALUATIONS ON FLOOD PROTECTION MEASURES FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass.
Available rom the National Technical Information Service, Springfield, VA 22161 as PB-249 116
Price codes: A05 in paper copy, A01 in microfiche
May 1975. 90 p, 20 tab. CRS-NERBC-EPA 2.1B(4.2).

Descriptors: *Water quality, *Environmental effects, *Flood protection, *Reservoirs, *Dams, *Connecticut River, *Channels, *Dikes, *Non structural alternatives, *Land use.
Identifiers: *Connecticut River Basin, Deerfield River, Ashuelot River, Beaver Brook, Sugar River, White River, Ammonoosuc River, Passumpsic River, Moose River, Mill River and Whetstone River.

Water quality evaluations are presented which discuss the possible ramifications of each selected alternative measure for reducing flood damages in the Connecticut River Basin. The evaluations consist of a matrix comparing the impact of each alternative on individual water quality parameters, and a qualified narrative explaining the matrix evaluations. Parameters included dissolved oxygen, sludge deposits, color and turbidity, taste and odor, pH, coliform bacteria, temperature change, chemical constituents, radioactivity and nutrients. Alternatives for the lower basin are: (1) seven upstream reservoirs plus non-structural measures; (2) raising existing dikes and walls, plus non-structural measures; (3) non-structural alternative. Non-structural alternatives are proposed for the upper basin above the Deerfield River confluence. Effects on water quality are analyzed in the immediate area of the proposed impoundment and downstream from it. Treatment costs for impaired water quality at impoundments are discussed. Land use around impoundments is considered a significant factor in determining water quality. Evaluations of effects on water quality were given for Deerfield River, Ashuelot River, Beaver Brook, Sugar River, White River, Ammonoosuc River, Passumpsic River, Moose River, Mill River and Whetstone River. Significant water quality problems are anticipated at Victory Dam on the Passumpic River from inundated organic areas, at Claremont Dam on the Sugar River from agricultural runoff, and at Honey Hill Dam on the Ashuelot River as developmental pressures increase from the Boston Metropolitan area. (Gentry-North Carolina)
W77-01695

INLAND WATER POLLUTION.
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 4
Price codes: A04 in paper copy, A01 in microfich
A Pilot Study. October 1974. 47 p, 2 map.

Descriptors: *Institutions, *Planning, *Comprehensive planning, *Water management(Applied), *Water quality, *Social aspects, *Legal aspects, *International law, *Economics, *Pollution, Canada, United States, Belgium, France.
Identifiers: *North Atlantic Treaty Organization(NATO), Saint John River basin(Canada US). Rhine-Meuse basin.

Agreeing that water quality planning and management require concerted international action to safeguard the economic and social well-being of nations, four member nations of NATO, Canada, United States, France and Belgium, decided to deal with 4 basic areas. First, comprehensive river basin planning and management. The St. John River basin where Canada and the U.S. were involved was examined. Recommendations are: the river basin should be adopted as the geographic unit for water quality planning and management; a comprehensive water quality management plan should include scientific, technical, social, economic, financial and institutional aspects; immediate problems and future needs should be considered; implementation of projects should fit into the developing comprehensive plan; early determination of water quality and quantity standards is essential. Second, indirect instruments in water management. Recommendations are: nations should consider levying charges on effluent discharges and providing financial assistance for pollution abatement, and enlisting public involvement to bring pressure to bear on polluters. Third, mathematical models. Use of models for management decision-making and development of new models is recommended. Fourth, determination of water quality objectives and standards in international water courses. Recommendations are: objectives should be developed jointly by countries involved; international water courses should be given the same priority as national water courses, appropriate institutional arrangements between countries should be created to plan and manage water courses as set forth in objectives. Balance in membership among nations participating in international institutions is desirable. Equal national representation is preferable. (Hufschmidt North Carolina)
W77-01697

REPORT OF RESEARCH AND RESEARCH NEEDS ON WATER QUALITY PROBLEMS IN THE STATE OF HAWAII,
E. F. Eldridge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 549, Price codes: A06 in paper copy, A01 in microfiche. Prepared for the Department of Health, Education and Welfare, Public Health Service, Washington, D. C., June 1963. 106 p, 14 fig, 7 tab, 144 ref.

Descriptors: *Water quality, *Water treatment, *Waste disposal, *Water pollution, *Saline water intrusion, *Water supply, Research facilities, Water resources development, *Hawaii, Industrial wastes, Estuaries, Bacteria, Viruses, Planning, *Research priorities.
Identifiers: *Ocean waste disposal, *Basal(Subsurface water).

A research program designed to provide the necessary knowledge to meet existing and potential problems of water quality in Hawaii is presented. Existing water quality problems include: (1) contamination of subsurface sources of domestic water supply, especially basal, stemming from salt water intrusion, effluent bacteria and virus, fertilizers, pesticides and herbicides, land disposal of refuse; (2) pollution of nearshore ocean waters caused by ocean disposal of effluent from sewage and waste treatment facilities. Industrial pollution sources are sugar mills, pineapple canneries, and an oil refinery. Recommended research prospectuses and phases of the studies are outlined as follows: (1) Studies of basal water problems- salt water intrusion, ground water movement, fate and travel of bacteria and virus, fate and travel of fertilizers, insecticides and herbicides, reactivity of soils and heavy metals. (2) Ocean disposal of effluents- oceanographic study, effluent-salt water mixing. (3) Water quality versus fish and shellfish-field investigation, bioassay and shellfish contamination. (4) Sewerage- sewage disposal by irrigation, sewage lagoons, combined sewage and industrial wastes, sewerage planning. (5) Industrial waste disposal- cane sugar mills and pineapple cannery wastes. (6) Salt water conversion. (7) Field and laboratory methods- organics, heavy metals and soils. An inventory of research carried out at the University of Hawaii is given. (Gentry-North Carolina)
W77-01698

PROJECT PROPOSAL FOR SURFACE-MINED LAND ENHANCEMENT (SMILE),
Federal Energy Administration, Washington, D.C. Office of Coal.
A. M. Hughes, and D. R. Maneval.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 567, Price codes: A04 in paper copy, A01 in microfiche. January 15, 1975. 65 p, 3 fig, 8 tab.

Descriptors: *Strip mines, *Land reclamation, *Public lands, Employment, *Mine wastes, Pennsylvania, Ohio, Maryland, Kentucky, Alabama, Mine drainage.
Identifiers: *Surface-mined Land Enhancement Project(SMILE), Job opportunities program.

The Federal Energy Administration initiated the proposal for Surface-Mined Land Enhancement (SMILE), with technical assistance from the Appalachian Regional Commission, to be conducted by employees from state goverments who will hire workers, place the contracts and do the engineering work. The project was initiated by the Job Opportunities Program which was established in December 1974 to dispense $125 million for labor intensive programs which would provide employment for those who were jobless during the 1974-1975 recession. Programs and projects chosen were those which could be implemented quickly, were capable of being completed in 12 months and were not inconsistent with locally approved comprehensive plans. The purpose of the program is to reclaim 6,000 acres of the worst strip-mined land on public property in 5 states - Pennsylvania, Ohio, Maryland, Kentucky and Alabama at a cost of less than $4,000 per acre. The total program is estimated to cost $24.8 million and provide 2,726 man-months of employment. Project goals are to restore public lands, demonstrate that strip-mined land can be reclaimed so as to encourage adoption of land restoration techniques, provide immediate employment and practical training, improve secondary employment opportunities and improve national coal production through resource recovery programs. Technical aspects, economic aspects and administrative aspects are outlined. An outside firm will evaluate the program and establish a system for monitoring and measuring project results as the project proceeds. (Gentry-North Carolina)
W77-01699

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: CARACAS,
Louisiana State Univ. Law Center, Baton Rouge.
For primary bibliographic entry see Field 6E.
W77-01706

REMOVAL OF CHROMIUM, CHROMATE, MOLYBDATE AND ZINC,
Chemical Separations Corp., Oak Ridge, Tenn. (Assignee).
R. C. Chopra.
U.S. Patent No. 3,972,810, 6 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 255, August 3, 1976.

Descriptors: *Patents, *Waste water treatment, Water quality control, *Water purification, Industrial water, Cooling water, Cooling towers, *Metals, *Ion exchange, Separation techniques, Anion exchange, Cation exchange, *Chromium, *Zinc.
Identifiers: *Chromate, *Molybdate.

The continuous evaporation of water circulating through a cooling tower will precipitate increasing concentrations of dissolved solids in the unevaporated water. Eventually as the water is continuously recycled back to the cooling tower, the concentration of dissolved solids will become so high that the water will no longer be able to function as a coolant. It is true that fresh water is added to make up for the water that is evaporated but the make-up water also contains dissolved solids so that gradually the concentration of solids will rise to a level which will prevent the water from serving as an efficient coolant. The solids which are objectionable include trivalent chromium, hexavalent chromate, molybdate and bivalent zinc. Accordingly the water containing these solids is contacted with a mixture of a weak base anion exchange resin and a weak acid cation exchange resin to remove the ions, the mixture is treated with an inorganic acid and a hydroxide to regenerate it so that it can be used in subsequent treatments. (Sinha-OEIS)
W77-01717

FLUIDIC OIL-WATER SEPARATOR,
Office of the Secretary (Navy), Washington, D.C. (Assignee).
A. J. Paszyc, D. Pal, and J. B. Curry.
U.S. Patent No. 3,972,814, 8 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 257, August 3, 1976.

Descriptors: *Patents, *Oily water, *Oil pollution, *Water pollution sources, *Water pollution treatment, *Separation techniques, Bubbles, Coalescence, Jets, Oil wastes.
Identifiers: Coanda effect.

The concept of an oil-water separator based on the fluid dynamic phenomenon called the Coanda Effect is utilized. An oil-water mixture jet is split into sub-jets. Each sub-jet enters a bounded region where a separation bubble is formed. Oil is removed from the separation bubble. The oil-water mixture exits the bounded regions into a pair of downstream chambers where the oil coalesces before exiting. A pair of fins are provided to decrease turbulence in the bounded regions and to assist in the retention of oil in the bounded regions. The device comprises a housing having an inlet port, an outlet port and a pair of offsetted walls. The oil-water mixture enters the housing parallel to the offsetted walls. A pair of concavely curved walls having an apex adjacent the inlet port splits the entering oil-water mixture into two sub-jets. (Sinha-OEIS)
W77-01718

OIL EXTRACTOR,
Change, Inc., Tulsa, Okla. (Assignee).
P. Mail, C. R. Ferrin, and R. J. Ely.
U.S. Patent No. 3,972,816. 5 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 257, August 3, 1976.

Descriptors: *Patents, *Oily water, *Oil pollution, *Water pollution sources, *Water pollution treatment, *Separation techniques, Industrial wastes, Coalescence, Emulsions, Dispersion, Equipment, Porous media, Oil wastes.

An oil extractor is described in which a dispersion of oil in water is resolved into two distinct comingled phases by passing the emulsion downward through a bed of properly sized granules and the comingled phases are then conveyed to a phase separator where the phases are dynamically separated and each is discharged separately and

independently of the other. The flow stream is initially directed into an inlet trap for removing relatively large particles and then through a centrifuge for removing substantially all of the entrained solids. The de-emulsifier is comprised of a chamber containing a bulk dense granular material, preferably water wettable. The flow stream is directed downward through the granular material for mechanically breaking the emulsion into two phases and separating the solids. The separator comprises a centrally placed entrance or spreader tube which discharges the flow stream radially outward through a body of granular media contained within a cylindrical housing. The oil and water are separated during passage of the flow stream through the granular media so that the oil percolates upward through a water reservoir for collection in a collector and the water flows downward by gravity for discharge through a suitable valve. (Sinha-OEIS)
W77-01719

CONTAINMENT BOOM,
G. J. Casey.
U.S. Patent No. 3,973,406, 11 p, 13 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 481, August 10, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Barriers, *Water pollution sources, *Water pollution control, Floating, Flexibility, Obstruction to flow, Oil wastes.
Identifiers: Containment.

A collapsible, quickly deployable floating boom barrier is made of an elongated curtain-like partition of strong, flexible, impervious material supported in a vertical position in the water by outrigger-type flotation units. The partition is in the form of an elongated, flexible belt and has sufficient longitudinal flexibility to encircle an oil spill or a ship that might be unloading or loading oil. The outrigger flotation units support the belt at a height above the surface of the water which is approximately 1/3 to 1/2 of the partition width. Each outrigger flotation unit is comprised of a frame and a float. The frame is connected to the side of the partition or belt for pivoting action about a vertical axis extending parallel and immediately adjacent to the side of the belt, and the float is connected to the frame for pivoting action about a horizontally extending axis. This articulation of the frame and float provides a self-stabilizing action of the outrigger flotation units. It also permits each float and frame to be folded back flat against the side of the belt to facilitate deployment of the floating barrier through narrow passageways such as between ships and piers. This articulation also permits the barrier to be folded accordian fashion for compact storage and transport. (Sinha-OEIS)
W77-01721

WATER POLLUTION MONITOR,
Process and Pollution Controls Co., Tulsa, Okla. (Assignee).
For primary bibliographic entry see Field 5A.
W77-01722

WATER CONDITIONING DEVICE,
Marian Co., Chicago, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W77-01727

WATER GATE,
For primary bibliographic entry see Field 8C.
W77-01729

METHOD AND APPARATUS FOR CONTROLLING THE DISCHARGE OF CONTAMINANTS FROM SHIPS,
I. Bartik.
U.S. Patent No. 3,974,940, 9 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1005, August 17, 1976.

Descriptors: *Patents, *Water pollution sources, *Waste water disposal, Effluents, *Oil pollution, *Monitoring, Discharge(Water), Water quality control, Water pollution control measurement
Identifiers: Ballast.

A system is provided for monitoring fluid discharged from ships and for determining the amount of contaminants, such as oil, in the fluid. The discharge from the ship is continuously monitored by a meter which will indicate the oil content of the discharge in parts per million. The indicated value may be charted for record purposes. The total volume of discharge from the ship and the speed of the ship may also be measured. The three values obtained by the measurements are processed in computers and a value is obtained for the amount of contaminants being discharged for each unit distance travelled by the ship. When the value reaches a predetermined amount, the discharge from the ship is interrupted, or reduced, so that at no time do the amount of contaminants discharged from the ship exceed a predetermined allowable limit with respect to the speed of travel of the ship. The system is also applicable for controlling the discharge from a ship to limit the concentration of oil in the discharge without regard for the speed of the ship or the total volume of the discharge. (Sinha-OEIS)
W77-01732

CONTAINMENT AND RIDDANCE OF OIL SPILLS,
Office of the Secretary (Navy), Washington, D. C. (Assignee).
D. M. Zall.
U.S. Patent No. 3,977,969, 2 p, 6 ref; Official Gazette of the United States Patent Office, Vol 949, no 5, p 2026, August 31, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution treatment, *Water pollution control, *Water quality control, *Separation techniques, Polymers, *Coagulation, Skimming.
Identifiers: High molecular weight polymers.

A method for rapidly and efficiently clearing oil spills consists of treating the surface of the oil spill with a polymer of high molecular weight which will coagulate the oil, thus forming a barrier between the oil and the water. Surface oil can then be raked and skimmed off the surface of the water. (Sinha-OEIS)
W77-01749

OIL BOOM AND METHOD OF SKIMMING FLOATING OIL FROM THE SURFACE OF A BODY OF WATER,
National Marine Service, Inc., St. Louis, Mo. (Assignee).
C. Veld.
U.S. Patent No. 3,979,291, 11 p, 10 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 264, September 7, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Barriers, Water pollution treatment, *Water pollution control, Water quality control, *Skimming, Flow control, Equipment, *Separation techniques.
Identifiers: Containment.

An oil boom assembly for collecting lighter liquid from the surface of a body of water includes elongated, parallel rows of vertical, buoyant barrier screen members connected together by flexible means and rigidly braced to hold the rows in parallel relationship in upright position when afloat in water. The rows are of progressively longer length and define open channels for the flow of liquid. A floating liquid diverter at one end of the boom diverts relatively moving liquid into the channels to cause transport currents to flow towards the opposite ends of the channels, where a liquid skimmer is provided to remove surface water and the lighter floating oil. The progressive barrier lengths permit flow of surface water around the ends of the shorter barriers into the channels between the barriers and may be arranged to cause the diverting of flow around the ends of the shorter barriers into the channels and towards the skimmer. (Sinha-OEIS)
W77-01759

A MANUAL OF LAWS, REGULATIONS, AND INSTITUTIONS FOR CONTROL OF GROUND WATER POLLUTION,
National Water Well Association, Worthington, Ohio.
J. H. Lehr, W. A. Pettyjohn, T. W. Bennett, J. R. Hanson, and L. E. Sturtz.
EPA Manual - 440/9-76-006, 1976, 416 p, 37 fig, 6 tab, 150 ref.

Descriptors: *Water pollution control, *Groundwater, Standards, *Institutions, *Water policy, *Regulation, Legislation, Operations, Publications, Administrative agencies, Legal aspects, Manpower, Management, *Water quality standards, Water law, Water pollution sources.
Identifiers: *Pollution control public policy, Legislative intent.

There is no single, simple approach to prevent ground water pollution. Activities that pollute groundwater, and the regulatory techniques necessary for their control, are many and highly varied. This manual describes ground-water resources and sources of pollution, then surveys existing regulations that affect ground-water quality. A number of statutory provisions are proposed that will enable a state to protect groundwater, and presents guidelines for the development of regulations designed to prevent pollution of groundwater. The central feature of the manual are the chapters concerning the regulation of possible contaminating activities. They are guides or starting points, for selection or modification by a state according to its particular needs. The manual is not a proposal to affect water-rights laws. Complete ground-water protection must include controls on the use of water under particular circumstances - reference is made to the propriety of such controls in effecting ground water pollution control. The purpose of the manual is to enchance knowledgeability in the states, and thus to enable establishment of adequate groundwater protection programs on the state or local level. (Heiss-NWWA)
W77-01776

CERTAIN CHARACTERISTIC FEATURES OF FLOWERING AND POLLINATION IN DUCKWEEDS (LEMNACEAE S. GRAY),
For primary bibliographic entry see Field 4A.
W77-01778

ENVIRONMENTAL ASPECTS OF A LARGE TROPICAL RESERVOIR - A CASE STUDY OF VOLTA LAKE, GHANA,
Smithsonian Institution, Washington, D. C. Office of International and Environmental Programs.
For primary bibliographic entry see Field 5C.
W77-01779

WATER POLLUTION INVESTIGATION: ASHTABULA AREA,
Calspan Corp., Buffalo, N. Y.
For primary bibliographic entry see Field 5C.
W77-01780

PROGRAM FOR PREVENTING AND ELIMINATING OIL POLLUTION OF THE BUFFALO RIVER,
Calspan Corp., Buffalo, N. Y.
For primary bibliographic entry see Field 5A.
W77-01782

WATER POLLUTION INVESTIGATION GENESEE RIVER AND ROCHESTER AREA,
O'Brien and Gere Engineers, Inc., Syracuse, NY.

For primary bibliographic entry see Field 5C.
W77-01785

WATER POLLUTION INVESTIGATION: BUFFALO RIVER,
Versar, Inc., Springfield, Va. General Technologies Div.
For primary bibliographic entry see Field 5C.
W77-01786

ESOO1: VERIFICATION OF MODEL FOR NEW YORK HARBOR,
Environmental Protection Agency, New York. Data Systems Branch.
S. C. Chapra, and S. Gordimer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 848, Price codes: A03 in paper copy, A01 in microfiche. Report No. ESOO1NYV, September 1973. 50 p. 5 fig., 1 tab., 2 ref.

Descriptors: *Computer models, *Estuaries, *Water quality, New York, Sewage effluents, Sewage treatment, Water pollution sources, Biochemical oxygen demand, Oxygen demand.
Identifiers: ESOO1 computer model, New York Harbor, Waste Loads.

A computer model which predicts the steady-state distribution of water quality variables for a one dimensional estuary, ESOO1, was applied to the New York Harbor by using the waste loads and the system parameters for average July-August conditions from 1954 to 1964. The model's applicability as a planning tool is illustrated by the effect of collecting raw waste discharges along the west side of New York City in a single treatment facility. Then, the effect of various treatment levels can be input to the model and the results can be compared with treatment options. However, the underlying assumptions of the model should be considered when applying it to a specific situation, for instance, in some cases the one dimensional approach may be inapplicable, e.g., the effect of high temperatures near a thermal discharge might be significantly minimized by assuming that the estuary is instantaneously mixed vertically and laterally. In other cases, the steady-state, tidally averaged approach would not be sufficient to indicate the time within the tidal cycle which allows the effects of tidal oscillations on water quality to be explicitly depicted. While this model will not supply the total planning horizon to water quality it is an excellent tool for many estuarine situations. Details of the model are presented. (Auen-Wisconsin).
W77-01791

ICE CONDITIONS AND THE PROPOSED CONTAINMENT AND REMOVAL OF SPILLED OIL ON ST. CLAIR AND DETROIT RIVERS,
Canada Centre for Inland Waters, Burlington, (Ontario).
G. Tsang.
Scientific Series No. 56, 1975. 30 p., 12 fig., 2 tab., 10 ref.

Descriptors: *Ice, *Oil spills, *Separation techniques, Rivers, Great Lakes, Water pollution control, Barriers, Design, Mathematical models, Frazil ice, Ice cover, Slush, Canada, Michigan.
Identifiers: *Oil-ice interfaces, Floating booms, Detroit River(Mich), St. Clair River(Ontario), Lake St. Clair(Ontario).

A method is examined for dealing with oil spills on the heavily-trafficked St. Clair and Detroit rivers during iced conditions, especially in the spring breakup when ice floes, slushes and other frozen masses may interfere with spill containment and removal operations. Oil and ice may be separated through use of single or multiple floating booms properly designed and deployed. Dynamic rather than static analysis is suggested for design of the ice and oil booms, and construction of timber is preferred over other materials. Boom designs are provided, along with equations needed for design of booms for specific conditions. Perforated booms may be used to separate oil and drift ice floes, and oil passing through the perforated gap is collectible by a non-perforated second boom. Light oil spilled on fast-flowing water may be contained and separated from the ice by a single non-perforated boom if the device is deployed at a proper angle to the flow. Surface skimming by high-volume pumping is suggested for removal of oil and oil-frazil ice mixtures. Deflecting booms are suggested to keep upstream ice from floating down to interfere with spill sites. Examination is made of the relative probability of various ice conditions for the Detroit River, the St. Clair River and Lake St. Clair. (Harris-Wisconsin)
W77-01802

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA--LAKE ERIE. VOL. II - THE FISHES OF THE CLEVELAND METROPOLITAN AREA INCLUDING THE LAKE ERIE SHORELINE,
John Carroll Univ., Cleveland, Ohio. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01807

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS,
Wisconsin Univ. - Madison. Dept. of Agricultural Economics.
R. R. Schneider, and R. H. Day.
Wisconsin Water Resources Center, Madison, Technical Report WIS WRC, 1976. 98 p, 76-02, 16 fig, 30 tab, 8 maps, 72 ref, 2 append. OWRT A-063-WIS(2). 14-31-0001-5050.

Descriptors: *Agricultural runoff, *Nitrates, *Sediment yield, *Sediments, *Nutrients, Agriculture, *Farm management, Crops, *Fertilizers, *Water pollution sources, *Farm wastes, Legislation, *Wisconsin, Water policy, Water pollution control, Alternative planning.

This study examines policies designed to curtail 3 types of diffuse agricultural pollution: (1). Runoff from winter-spread manures; (2). Sediment in rill and sheet erosion; (3). Nitrate pollution of groundwater resulting from field-applied manure and chemical nitrogen. The following policies are tested on four farm sizes at 4 locations: (1). enforce Wisconsin's Model Sediment Control Ordinance; (2). prohibit all manure spreading in winter; (3). prohibit winter manure spreading on sloped land; (4). prohibit winter manure spreading close to streams, lakes, or open ditches; (5). restrict the excess of applied nitrogen over estimated plant uptake of nitrogen; (6). combine 1, 3, 4 and 5 above; (7). combine 1, 2 and 5 above; (8). restrict average total sediment yield. The effects of these policies on efficiency of resources allocation, and their differential impact in the glaciated and unglaciated regions of the state are explored. The framework for efficiency analysis is that of a partial competitive equilibrium. The estimation of appropriate data for the analysis is an important and integral part of the study. The marginal cost of pollution reduction is calculated for each policy and the marginal cost curve is generated for a sediment policy on selected farms. These data are presented along with the physical quantities of pollutant reduction.
W77-01810

DILUTION FOR EUTROPHICATION CONTROL IN MOSES LAKE: HYDRAULIC MODEL STUDY,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. E. Nece, J. R. Reed, and E. B. Welch.
Charles W. Harris Hydraulics Laboratory, Technical Report 49, July 1976. 57 p, 21 fig, 1 tab, 15 ref. OWRT A-082-WASH(1), 143-34-10E-3992-3037.

Descriptors: *Eutrophication, Lakes, Sewage effluents, *Waste dilution, *Washington, *Water quality control, Forecasting, *Nutrient removal, Phosphorus, *Hydraulic models, Water transfer.
Identifiers: *Moses Lake(Wash).

Addition of Columbia River water from the Columbia Basin Project irrigation canal system has been proposed in the past as a way of controlling eutrophication in Parker Horn, one of the arms of Moses Lake which is adjacent to the City of Moses Lake, Washington. A vertically distorted physical scale model of the affected regions of Moses Lake was built, and dilution of lake water by the added inflows was measured for two nominal dilution schemes: 500 cubic feet per second of dilution water added for a 20-day pulse, and 1000 cubic feet per second over a 10-day period. Changes in spatial average concentrations of initial lake water were measured in a number of segments of the lake at the ends of the dilution periods, and the temporal decay of lake water concentration following the start of the dilution pulse was measured at a number of discrete sampling stations. Predictions in changes of lake water quality were made on the basis of the model-determined dilutions. Emphasis in these predictions was placed on the effects of changes in phosphorus content. The higher-discharge shorter-duration dilution inflow was the better of the two strategies considered. Effects of sewage effluent removal from Pelican Horn, another arm of the lake also adjacent to the City of Moses Lake, were also considered as well as addition of dilution water to this arm.
W77-01814

EVALUATION OF EFFECTIVENESS OF RESERVOIR DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. E. Garton.
Completion Report, (1976). 24 p, 17 fig, 11 ref. OWRT A-052-OKLA(2). 14-34-0001-6037.

Descriptors: *Destratification, Biochemical oxygen demand, Lakes, *Dissolved oxygen, *Oklahoma, Evaluation, Reservoirs, *Pumps, *Pumping, Water quality control.
Identifiers: *Ham's Lake(Okla), *Lake destratifier(Pump).

A 1-hp prototype lake destratifier was designed, constructed and tested on Ham's Lake. The pump was a six foot ventilating fan supported from an 80 x 80 inch redwood, expanded foam flotation, sandwich. The performance in water, calculated from the performance in air, was 27,000 gallons per minute. Tests showed the power requirement to be within ten percent of the calculated values. The device was placed in operation on June 19, 1975. A 10.1C difference between the top and bottom was reduced to 1.2C difference in four days. The 9 meter water temperature increased 8.5C. The entire body of water continued warming after pumping began and remained between 27 and 29 until the fall turnover in early September. The water had zero dissolved oxygen below 5 meters and in excess of 8 mg/l above 4 meters when pumping started. After four days dissolved oxygen ranged from 7.2 mg/l at the surface to 2.9 mg/l at the bottom. Levels of five day BOD were kept below 2 mg/l after pumping started. Overall water quality in the reservoir was improved. Destratification of the other water quality parameters monitored was observed.
W77-01821

BASELINE CHARACTERIZATION: MARINE MAMMALS,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01826

RESOURCE ASSESSMENT: ABUNDANCE AND SEASONAL DISTRIBUTION OF BOWHEAD AND BELUKHA WHALES - BERING SEA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01828

ABUNDANCE AND SEASONAL DISTRIBUTION OF BOWHEAD WHALES AND BELUKHA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div., and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01829

MORBIDITY AND MORTALITY OF MARINE MAMMALS - BERING SEA,
Alaska Univ., College. Inst. of Artic Biology; and Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01830

BIOLOGY OF THE HARBOR SEAL, PHOCA VITULINA RICHARDI, IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 6G.
W77-01831

THE NATURAL HISTORY AND ECOLOGY OF THE BEARDED SEAL (ERIGNATHUS BARBATUS) AND THE RINGED SEAL (PHOCA (PUSA) HISPIDA),
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01832

AN AERIAL CENSUS OF SPOTTED SEALS, PHOCA VITULINA LARGHA,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01833

TROPHIC RELATIONSHIPS AMONG ICE INHABITING PHOCID SEALS,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01834

ASSESSMENT OF THE DISTRIBUTION AND ABUNDANCE OF SEA OTTERS ALONG THE KENAI PENINSULA, KAMISHAK BAY AND THE KODIAK ARCHIPELAGO,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01835

DISTRIBUTION AND ABUNDANCE OF SEA OTTERS IN SOUTHWESTERN BRISTOL BAY,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01836

POPULATION ASSESSMENT, ECOLOGY AND TROPHIC RELATIONSHIPS OF STELLER SEA LIONS IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 6G.
W77-01837

THE RELATIONSHIPS OF MARINE MAMMAL DISTRIBUTIONS, DENSITIES AND ACTIVITIES TO SEA ICE CONDITIONS,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01838

ENVIRONMENTAL ASSESSMENT OF THE BERING SEA: BENTHIC BIOLOGY,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01839

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF THE WESTERN BEAUFORT SEA BENTHOS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01840

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE, AND LIFE HISTORIES OF BENTHIC ORGANISMS,
Oregon State Univ. Corvallis. School of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01841

OUTER CONTINENTAL SHELF ASSESSMENT PROJECT. RAZOR CLAM HABITAT SURVEY - GULF OF ALASKA,
Alaska Dept. of Fish and Game, Kodiak.
For primary bibliographic entry see Field 6G.
W77-01843

A DESCRIPTION AND NUMERICAL ANALYSIS OF THE FACTORS AFFECTING THE PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6G.
W77-01844

REVIEW OF LITERATURE AND HISTORICAL DATA ON NON-SALMONID PELAGIC FISHERIES RESOURCES OF THE EASTERN BERING SEA AND GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01845

BASELINE CHARACTERIZATION, LITTORAL BIOTA, GULF OF ALASKA AND BERING SEA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.
For primary bibliographic entry see Field 6G.
W77-01846

PLANKTON OF THE GULF OF ALASKA - ICHTHYOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01847

INITIAL ZOOPLANKTON INVESTIGATIONS,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-01848

ZOOPLANKTON AND MICRONEKTON STUDIES IN THE BERING -CHUKCHI/BEAUFORT SEAS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01850

PHYTOPLANKTON STUDIES - BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01851

BASELINE STUDIES OF DEMERSAL RESOURCES OF THE NORTHERN GULF OF ALASKA SHELF AND SLOPE: AN HISTORICAL PREVIEW,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01852

BASELINE STUDIES OF DEMERSAL RESOURCES OF THE EASTERN BERING SEA SHELF AND SLOPE,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01853

BEAUFORT SEA ESTUARINE FISHERY STUDY,
Alaska Dept. of Fish and Game, Fairbanks. Sport Fish Div.
For primary bibliographic entry see Field 6G.
W77-01854

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE AND PRODUCTIVITY OF BENTHIC ORGANISMS OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01856

POLLUTION OF THE RIVER TYNE ESTUARY--THE USE OF MATHEMATICAL MODELS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-01889

AGRICULTURAL WATER POLLUTION: SOME PROBLEMS ASSOCIATED WITH ITS CONTROL,
Kansas Univ., Lawrence. Dept. of Geography.
J. W. Merchant, Jr., and G. A. Marotz.
The Journal of Geography, Vol. 74, No. 7, p 419-429, October, 1975. 1 fig, 1 tab, 22 ref.

Descriptors: *Soil management, *Erosion control, *Agricultural chemicals, *Water pollution sources, *Soil erosion, Water pollution control, Pollution abatement, Surface runoff, Nitrogen compounds, Nutrients, Soil conservation, Great Plains, *Kansas, Chemical wastes.

Nitrogen nutrients from fields and pastures are responsible for a substantial portion of the nation's overall water quality problems and are not as easily controlled as most other sources of pollution. A study was undertaken in Douglas County, Kansas, among land owners who as individuals make soil management decisions to assess their perception of the problem. Results show that (1) the soil erosion problem is seldom viewed correctly and farmers are often unaware of conservation programs or are unwilling to participate; (2) farmers use erosion control to protect their own land; (3) treatment is often undertaken without assistance from the U.S. Soil Conservation Service, or if done with their aid, done so reluctantly; (4) many consider the soil erosion problem to be largely overcome; (5) a majority believe that farms are pollutant sources but the situation is exaggerated in comparison with that of the cities, and (6) false or inaccurate ideas on self-purification of water, the conservation movement, movement of chemicals in the soil, and operations of the Soi

Conservation Service are prevalent. Although the tudy was conducted among a small group of farers, the authors believe that it is representative f many other watersheds of the central Great lains. They suggest increased publicity concernng the pollution and the fragility and complexity f the ecosystem. (Jamail-Arizona)
W77-01898

HARACTERIZATION OF URBAN RUNOFF - NEW JERSEY,
Rutgers - The State Univ., New Brunswick N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W77-01945

MATHEMATICAL MODELING FOR WATER QUALITY MANAGEMENT IN STREAMS UNDER UNSTEADY HYDRAULIC CONDITIONS,
Tennessee Univ., Knoxville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-01946

SOUTHEASTERN FORESTS AND THE PROBLEM OF NON-POINT SOURCES OF WATER POLLUTION,
Forest Service (USDA), Franklin, N. C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W77-01952

WATER QUALITY ANALYSIS, UPPER MISSISSIPPI RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 982, Price codes: A06 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/64, July 1975, 106 p. WQ5AC025.

Descriptors: Sites, *Mississippi River Basin, Minnesota, *River basins, Ecology, Federal Water Pollution Control Act, Environments, Limnology, *Water pollution control, Pollution abatement, Water quality, Forecasting, Water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Upper Mississippi River Basin(Minn).

A comprehensive water quality analysis at the Upper Mississippi River Basin was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality conditions and (2) projected resultant water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01953

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, GRAIN MILLING.
Development Planning and Research Associates, Inc., Manhattan, Kans.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 223, Price codes: A10 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/76, November 1975, 184 p. WQ5AC011.

Descriptors: *Grains(Food), *Economic impact, Economics, Forecasting, Federal Water Pollution Control Act, Water pollution control, *Industries, Capital costs, Pollution abatement, Engineering costs, Mills.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Grain milling.

The economic impacts on selected segments of the grain milling industry (ready to eat cereals, rice mills using parboiling processes and the corn wet mills of the wheat starch portion of the wet corn industry) to achieve the 1977 (BPT) and 1983 (BAT) limitation requirements of the Federal Water Pollution Control Act Amendments of 1972 were assessed. Since most of these plants discharge into municipal systems and are exempt from both BPT and BAT requirements, there are only 7 such plants subject to controls. Total capital investment (in 1973 dollars) will be an estimated $28,252 for BPT and $7,114 for BAT. Most significant impacts will fall on the wet corn milling segment where prices will increase an estimated 0.7% over baseline for 1977 controls with a total of 0.8% over baseline for BAT. The only closure expected to result from BPT and BAT will be in the wheat starch category, due to already marginal profits. (NCWQ)
W77-01954

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, COLUMBIA RIVER.
Parametrix, Inc., Seattle, Wash.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 324, Price codes: A10 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/72, December 1975, 195 p. WQ5ACO36.

Descriptors: Rivers, *Columbia River, *River basins, Ecology, *Environmental effects, Environment, Limnology, Federal Water Pollution Control Act, Water pollution control, Pollution abatement, Forecasting, Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A comprehensive environmental impact assessment at the Columbia River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing environmental conditions and (2) projected anticipated biological, ecological and environmental change, impacts and benefits, assuming specific reductions in point source effluent loadings and resultant water quality within the site. This site assessment was one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01955

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, UPPER RIO GRANDE,
Academy of Natural Sciences of Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 228, Price codes: A07 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/67, June 1975, 163 p. WQ5AC044.

Descriptors: Rivers, *New Mexico, *Rio Grande River, Ecology, Federal Water Pollution Control Act, Environments, *Environmental effects, Limnology, Water pollution control, Colorado, Texas, Pollution abatement, Forecasting, *Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Upper Rio Grande River(N Mex).

A comprehensive environmental impact assessment at the Upper Rio Grande was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing environmental conditions and (2) projected anticipated biological, ecological and environmental change, impacts and benefits, assuming specific reductions in point source effluent loadings and resultant water quality within the site. This site assessment was one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01956

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HOUSATONIC RIVER,
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 926, Price codes: A18 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/57, December 1975, 390 p. WQ5AC034.

Descriptors: Rivers, Federal Water Pollution Control Act, Ecology, *Environmental effects, Environment, *Massachusetts, Limnology, Water pollution control, Forecasting, *Water qualty, Water treatment, Pollution abatement, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Housatonic River(Mass).

A comprehensive water quality analysis and environmental impact assessment at the Housatonic River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01957

STRATEGIC ENVIRONMENTAL ASSESSMENT SYSTEM, RESIDUALS FORECASTING, AN ANALYSIS OF RESULTS,
International Research and Technology Corp., Washington, D. C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 041, Price codes: A04 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/106, February 1976, 64 p. WQ5AC018.

Descriptors: *Forecasting, *Industrial wastes, Environmental effects, Federal Water Pollution Control Act, Cost analysis, Waste disposal, Economic impact, *Estimates, *Water pollution control, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

The Strategic Environmental Assessment System (SEAS), developed by the Environmental Protection Agency was used to assess the impacts of the recommended control strategies of the Federal

Water Pollution Control Act Amendments of 1972 (P.L. 921500) on the generation and the discharge of industrial residuals. A set of water residual coefficients and economic growth projections for 350 significant industrial point source categories were entered into SEAS. Considered was the extent to which the disaggregation of sectors and the incorporation of technological information has improved the ability of SEAS to forecast residual discharge levels, along with its implications for national environmental policy. Also considered is the predictive value of the model. Improvements needed to make SEAS a more fully analytical tool are discussed. (NCWQ)
W77-01958

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PILOT STUDY, FIVE INDUSTRIES,
Conference Board, Inc., New York.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 628, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/73, June 1975, 745 p. WQ4AC007.

Descriptors: Alkalies, *Economic impact, Chlorides, Forecasting, Blast furnaces, Engineering costs, Steel plants, Water pollution control, Pulp mills, Pollution abatement, Paperboards, Federal Water Pollution Control Act, Paper mills, Chemical industry.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An analysis was made of historical patterns of water pollution and treatment per unit of physical output in five industries -- blast furnaces and steel mills (SIC 3312), petroleum refining (SIC 2911), industrial organic chemicals (SIC 2818), pulpmills, papermills, paperboard mills (SIC 2611, 2621, 2631), and alkalies and chlorine (SIC 2812) -- in light of changes in technology, production processes, output mix and input mix. Impacts are measured by estimated deviation from baseline, i.e., projected water pollution abatement in the absence of the 1972 Federal Water Pollution Control Act Amendments. An analysis of how the industries will meet the 1977(BPT), 1983(BAT) and 1985(EOD) goals and requirements of the Act is given along with estimates of associated costs. Included are estimated investment and operating expenditures for the five industries necessary to meet the law's requirements. (NCWQ)
W77-01959

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, CHEMICAL AND ALLIED INDUSTRIES,
International Research and Technology Corp., Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 289, Price codes: A20 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/97, March 1976, 470 p. WQ5AC015.

Descriptors: *Chemicals industry, *Cost analysis, Federal Water Pollution Control Act, Construction costs, *Economic impact, Forecasting, Operating costs, Pollution abatement, Engineering costs.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An examination was made of the economic impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the chemical and allied industries. Growth estimates for 1972-1983 for 374 chemicals are presented along with estimated capital requirements, operating and maintenance and annualized costs for three levels of abatement -- best practicable treatment technology, best available technology and elimination of the discharge of pollutants. Included are aggregated chemial-specific costs to arrive at total firm and industry abatement costs and evaluations of alternative pricing responses to increased production costs. (NCWQ)
W77-01960

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ESCAMBIA RIVER AND BAY,
Atlantis Scientific, Tallahassee, Fla.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 447, Price codes: A12 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/80, March 1976, 269 p. WQ5AC037.

Descriptors: *Bays, *Florida, *Environmetal effects, *Rivers, Federal Water Pollution Control Act, Ecology, Environments, Limnology, Water pollution control, Forecasting, Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Escambia River-Bay(Fla).

A comprehensive water quality analysis and environmental impact assessment at the Escambia River and Bay was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01961

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GUADALUPE-SAN ANTONIO RIVER BASIN,
Water Resource Engineers, Inc., Austin, Tex.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 430, Price codes: A14 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/92, March 1976, 314 p. WQ5AC025.

Descriptors: Rivers, *Texas, River basins, *Environmental effects, Sites, Federal Water Pollution Control Act, Ecology, Limnology, Water pollution control, Water quality, Forecasting, Water treatment, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Guadalupe-San Antonio River Basin(Tex).

A comprehensive water quality analysis and environmental impact assessment was undertaken at the Guadalupe-San Antonio River Basin as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01962

ENVIRONMENTAL IMPACT ASSESSMENT WATER QUALITY ANALYSIS, ST. JOHN RIVER ESTUARY (FLORIDA),
Atlantis Scientific, Tallahassee, Fla.
Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-251 225 Price codes: A12 in paper copy, A01 in microfiche National Commission on Water Quality, Washing ton, D.C. Report NCWQ 75/81, March 1976, 272 p WQ5AC037.

Descriptors: *Rivers, *Florida, *Environmenta effects, Ecology, River basins, Limnology Federal Water Pollution Control Act, Water pollu tion control, Water quality, Forecasting, Wate treatment, Sites.
Identifiers: Federal Water Pollution Control Ac Amendments of 1972, *St. John River(Fla).

A comprehensive water quality analysis and en vironmental impact assessment at the St. Joh River (Florida) was undertaken as part of a na tional assessment of anticipated environmental im pacts of theoretically achieving or not achievin the requirements of the Federal Water Pollutio Control Act Amendments of 1972 (P.L. 92-500 The analysis (1) characterized historical and exist ing water quality and environmental conditions (2) projected resultant water quality, assumin specific levels of wastewater treatment to poin source effluents entering the study site, and (3) an ticipated biological and environmental effects, im pacts and benefits to result from projecte changes in water quality. This site assessment i one of 41 similar studies conducted for the En vironmental Sciences sector of the National Com mission on Water Quality. (NCWQ)
W77-01964

NOVEMBER 1975 STAFF DRAFT REPORT REVIEW AND COMMENT,
National Research Council, Washington, D. C.
Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-252 040 Price codes: A04 in paper copy, A01 in microfiche National Commission on Water Quality, Washing ton, D.C. Report NCWQ 75/102, January 1976, 7 p. WQ4AC002.

Descriptors: Water pollution control, Pollutio abatement, Water law, Federal Water Pollutio Control Act, Water quality.
Identifiers: *National Commission on Wate Quality, *Federal Water Pollution Control Ac Amendments of 1972.

Review and comments are presented on majo findings and supporting materials in the Staf Draft Report of the National Commission o Water Quality, published in November, 1975 (NCWQ)
W77-01965

ENVIRONMENTAL IMPACT ASSESSMENT WATER QUALITY ANALYSIS, GULF O ALASKA.
Tetra Tech, Inc., Pasadena, Calif.
Available from National Technical Informatio Service, Springfield, VA 22161 as PB-251 322 Price codes:A12 in paper copy, A01 in microfiche National Commission on Water Quality, Washing ton, D.C. Report NCWQ 75/84, March 1976, 255 p WQ5ACO27.

Descriptors: Sites, *Alaska, *Environmental ef fects, *Gulfs, Federal Water Pollution Contro Act, Ecology, Limnology, Water pollution con trol, Forecasting, Water quality, Water treatment Identifiers: *Federal Water Pollution Control Ac Amendments of 1972, *Gulf of Alaska.

A comprehensive water quality analysis and en vironmental impact assessment was undertaken a the Gulf of Alaska as part of a national assessmen of anticipated environmental impacts of theoreti cally achieving or not achieving the requirement

and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01966

CAPITAL MARKETS AND WATER QUALITY NEEDS: 1975-1985.
Conference Board, Inc., New York.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 042, Price codes: A05 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. 20036. Report NCWQ 75/101, June 1975, 88 p. WQ4AC007-2.

Descriptors: Economics, *Government finance, Forecasting, Federal Water Pollution Control Act, Water pollution control, *Economic impact, Pollution abatement, Financing, Capital, Cost analysis, Investment, Water quality.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Remarks and comments presented in June, 1975 at a conference -- Capital Markets and Water Quality Needs: 1975-1985 -- sponsored by the Conference Board are presented. Statements on various aspects of the financial impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) are given along with summary analyses and conclusions. (NCWQ)
W77-01967

WATER QUALITY ANALYSIS, THE POTOMAC RIVER.
GKY and Associates, Alexandria, Va.
Available from National Technical Information Service, Springfield, VA 22161 as PB-252 038, Price codes: A06 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/91, January 1975, 110 p. WQ5AC060.

Descriptors: Sites, *Potomac River, *Environmental effects, Rivers, Federal Water Pollution Control Act, River basins, Ecology, Water pollution control, Pollution abatement, *Water quality, Forecasting, Water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A comprehensive water quality analysis at the Potomac River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality conditions and (2) projected resulting water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01968

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, S. CALIFORNIA BIGHT.
Tetra Tech, Inc., Pasadena, California.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 435, Price codes: A20 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/93, April 1976, 468 p. WQ5AC027.

Descriptors: Bays, *California, *Environmental effects, Sites, Federal Water Pollution Control Act, Ecology, Limnology, Water pollution control, *Water quality, Forecasting, Water treatment, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Southern California Bight.

A comprehensive water quality analysis and environmental impact assessment was undertaken in the S. California Bight as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01969

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HAWAII.
Tetra Tech, Inc., Pasadena, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 320, Price codes: A12 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/83, March 1976, 253 p. WQ5AC027.

Descriptors: Sites, *Hawaii, *Environmental effects, Ecology, Federal Water Pollution Control Act, Limnology, Water pollution control, Forecasting, *Water quality, Water treatment, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A comprehensive water quality analysis and environmental impact assessment was undertaken in Hawaii as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01970

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, PUERTO RICO.
Tetra Tech, Inc., Pasadena, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 323, Price codes: A11 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/82, March 1976, 250 p. WQ5AC027.

Descriptors: Sites, *Puerto Rico, *Environmental effects, Ecology, Federal Water Pollution Control Act, Limnology, Water pollution control, *Water quality, Forecasting, Water treatment, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A comprehensive water quality analysis and environmental impact assessment was undertaken in Puerto Rico as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01971

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, SOUTH PLATTE.
Tetra-Tech, Inc., Pasadena, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 446, Price codes: A20 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/78, December 1975, 453 p. WQ5AC027.

Descriptors: Rivers, Federal Water Pollution Control Act, Ecology, *Environmental effects, Environment, *Colorado, *Nebraska, Limnology, Water pollution control, Pollution abatement, Forecasting, *Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *South Platte River(Colo-Neb).

A comprehensive water quality analysis and environmental impact assessment at the South Platte River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01972

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, SUSQUEHANNA RIVER.
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 925, Price codes: A14 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/56, December 1975, (186 p). WQ5AC034.

Descriptors: *Rivers, *Environmental effects, Ecology, Federal Water Pollution Control Act, Environment, *New York, Limnology, Water pollution control, Forecasting, *Water quality, Water treatment, Sites, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Susquehanna River(NY).

A comprehensive water quality analysis and environmental impact assessment at the Susquehanna River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the

requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01973

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, DIGEST OF LEGAL ISSUES.
Bureau of National Affairs, Inc., Washington, D.C. Environment and Safety Research Service.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 975, Price codes: A20 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/66, September 1975, 469 p. WQ5AC097.

Descriptors: *Water law, Public rights, *Legal aspects, Federal Water Pollution Control Act, Water rights, *Institutions, *Institutional constraints, *Water pollution control, Regulations.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A summary analysis of significant legal issues raised by the litigation of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) is presented. Issues examined include jurisdiction, effluent limitations guidelines, regulations, special problems raised by the steam electric power industry, new source performance standards, National Pollution Discharge Elimination System permits, Environmental Protection Agency's general counsel's decisions, Section 208 management planning and impoundment. Issues are identified and major arguments presented by the litigants are described. (NCWQ)
W77-01974

WATER POLLUTION CONTROL LAW OF 1972, REGIONAL IMPACTS, KANAWHA RIVER.
Dames and Moore, Cincinnati, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 105, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/30, November 1975, 877 p. WQ5AC055.

Descriptors: *River basins, *Regional analysis, *West Virginia, Regions, Federal Water Pollution Control Act, Water pollution control, Pollution abatement, Water quality, Water law, Economic impact, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Kanawha River(W Va).

The environmental, social, economic, and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Kanawha River are reviewed. The study concentrates on the impacts to be experienced in the Charleston, West Virginia area. Water quality changes, as a result of the Act's 1977 (best practicable treatment technology), 1983 (best available technology) and 1985 (elimination of the discharge of pollutants) requirements and goals are presented. Estimated costs (in 1973 dollars) to meet the goals of the Act are given along with the technology necessary to meet required abatement levels. Recreational, social and economic effects of the Act are considered. Existing and future institutional arrangements necessary to implement the law are examined. (NCWQ)
W77-01975

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, SANTEE RIVER BASIN.
Academy of Natural Sciences of Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 354, Price codes: A13 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. 20036. Report NCWQ 75/71, July 1975, 260 p. WQ5AC044.

Descriptors: Rivers, Federal Water Pollution Control Act, Ecology, *Environmental effects, Environment, *River basins, Limnology, *South Carolina, *North Carolina, *Water pollution control, Pollution abatement, Forecasting, Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Santee River Basin(SC-NC).

A comprehensive environmental impact assessment at the Santee River Basin was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The assessment (1) characterized historical and existing environmental conditions and (2) projected biological, ecological and environmental change, impacts and benefits, assuming specific reductions in point source effluent loadings and resultant water quality within the site. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01976

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ST. JOHN RIVER (MAINE).
Meta Systems, Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 942, Price codes: A16 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/58, December 1975, 335 p. WQ5AC047.

Descriptors: Rivers, *Maine, *Environmental effects, Ecology, Federal Water Pollution Control Act, Environments, Canada, Limnology, Water pollution control, Forecasting, *Water quality, Water treatment, Pollution abatement, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *St. John River(Maine), New Brunswick.

A comprehensive water quality analysis and environmental impact assessment at the St. John River (Maine) was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01977

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, DELAWARE RIVER BASIN, (PARTS 1, 2, AND 3).
Betz Environmental Engineers, Inc., Plymouth Meeting, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 910, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/28, September 1975. 1,354 p. WQ5AC048..

Descriptors: *River basins, *Regional analysis, Regions, Federal Water Pollution Control Act, Water pollution control, *Delaware River, Pollution abatement, Environmental effects, Water law, Social aspects, Economic impact, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Delaware River Basin.

The environmental, social, economic, and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) on the lower half of the Delaware River Basin are reviewed. Among the environmental impacts to be experienced are reduced bacteriological concentrations and the recovery of certain fish populations. Water oriented recreation will increase approximately 170% in response to projected water quality improvement. Institutional arrangements are limited by such factors as an inadequate regional data processing system, manpower shortages and a lack of Federal funds. Capital costs to meet the 1977 and 1983 effluent requirements of the law, annualized over a 20-year period at 7% interest, will be $12.5 million/yr (1973 dollars). With the addition of O and M costs, this figure jumps to an annual cost of $39 million during 1977 and $48 million during 1983. The 1977 requirement of the Act will not be met until 1980 in the basin. (NCWQ)
W77-01978

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, GREAT LAKES-LAKE ERIE, (VOLUMES 1, 2, AND 3).
Dalton-Dalton-Little-Newport, Inc., Cleveland, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 009, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/49, December 1975. 1,081 p.

Descriptors: Lakes, *Regional analysis, *Lake Erie, Regions, Federal Water Pollution Control Act, Water pollution control, Great Lakes, Pollution abatement, Environmental effects, Water law, Social aspects, Economic impact, Social change.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

The environmental, social and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Lake Erie region are reviewed. Water quality changes as a result of the Act's 1977 (best practicable treatment technology), 1983 (best available technology) and 1985 (elimination of the discharge of pollutants) standards and goals are presented. Estimated costs in 1973 dollars to meet the goals of the Act are given along with the technology necessary to meet required abatement levels. Recreational, social and economic effects of the Act are considered. Existing and future institutional arrangements necessary to implement the law are examined. (NCWQ)
W77-01979

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, CHATTAHOOCHEE-FLINT-APALACHICOLA, (PARTS 1 AND 2).
Hammer, Siler, George Associates, Atlanta, Ga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 318, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/108, March 1976. 1,092 p. WQ5AC057.

scriptors: *River basins, *Regional analysis, gions, Federal Water Pollution Control Act, ater pollution control, *Georgia, Pollution atement, Environmental effects, Water law, So- l aspects, Economic impact, Forecasting.
ntifiers: *Federal Water Pollution Control Act nendments of 1972, *Chattahoochee-Flint-alachicola(Geo).

e environmental, social and institutional im- cts of the Federal Water Pollution Control Act nendments of 1972 (P L. 92-500) on the Chat- oochie-Flint-Apalachicola River system are iewed. Water quality changes, as a result of the t's 1977 (best practicable treatment technolo- , 1983 (best available technology) and 1985 mination of the discharge of pollutants) stan- rds and goals are presented. Estimated costs (in 73 dollars) to meet the goals of the Act are given ng with the technology necessary to meet quired abatement levels. Recreational, social d economic effects of the Act are considered. isting and future institutional arrangements cessary to implement the law are examined. CWQ)
77-01980

ATER POLLUTION CONTROL ACT OF 1972, EGIONAL IMPACTS, OHIO RIVER BASIN, OLUMES 1 AND 2).
mes and Moore, Cincinnati, Ohio.
vailable from the National Technical Informa- n Service, Springfield, VA 22161 as PB-249 680, ce codes: A99 in paper copy, A01 in microfiche. ational Commission on Water Quality, Washing- n, D.C. Report NCWQ 75/26, November 1975. 93 p.

scriptors: *River basins, *Regional analysis, gions, Federal Water Pollution Control Act, ater pollution control, *Ohio River, Pollution atement, Environmental effects, Water law, So- l aspects, Economic impact, Forecasting.
ntifiers: *Federal Water Pollution Control Act nendments of 1972, *Ohio River Basin.

e environmental, social and institutional im- cts of the Federal Water Pollution Control Act nendments of 1972 (P.L. 92-500) on the Ohio ver Basin are reviewed. The study area covers ncinnati and the Huntington-Ashland-Port- outh region. Water quality changes, as a result the Act's 1977 (best practicable treatment chnology), 1983 (best available technology) and 85 (elimination of the discharge of pollutants) ndards and goals are presented. Estimated costs 1973 dollars) to meet the goals of the Act are ven along with the technology necessary to meet quired abatement levels. Recreational, social d economic effects of the Act are considered. isting and future institutional arrangements cessary to implement the law are examined. CWQ)
77-01981

ATER POLLUTION ABATEMENT ECHNOLOGY, CAPABILITIES AND COSTS, UBLICLY OWNED TREATMENT WORKS, OLUMES 1, 2 AND 3).
etcalf and Eddy, Inc., Boston, Mass.
r primary bibliographic entry see Field 5D.
77-01982

ATER POLLUTION ABATEMENT ECHNOLOGY, CAPABILITIES AND COSTS, TEAM ELECTRIC POWER INDUSTRY, OLUME 1, 2 AND 3).
knekron, Inc., Berkeley, Calif.
vailable from the National Technical Informa- n Service, Springfield, VA 22161 as PB-251 372, ice codes: A99 in paper copy, A01 in microfiche. ational Commission on Water Quality, Washing- n, D.C. Report NCWQ 75/86, March 1976. 1,164

Descriptors: Economics, *Industrial wastes, Engineering costs, Waste disposal, *Estimated costs, *Water pollution control, Forecasting, Water quality, Federal Water Pollution Control Act, Industrial water, *Electric power industry, Pollution abatement, Electric power production, *Cost analysis, *Water quality standards.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Steam electric power industry.

Details are presented of the capabilities of water pollution abatement technologies and associated capital, operating and maintenance costs necessary for the industry to meet the thermal and chemical effluent discharge requirements of the 1972 Water Pollution Control Act Amendments. Results suggest that some of the effluent limitations for chemical discharges are inconsistent and will produce little significant reduction of effluents. Some effluent limitations may actually increase the effluent quantities of specific pollutants. Estimates of capital costs range from $4.45 to $9.04 billion (1973 dollars). Real total operating costs are projected to increase by 3%-5%. An econometric model is used to estimate changes in prices, demand, return on equity, and additional financial parameters due to water pollution control expenditures. Real electricity prices will increase an estimated .5%-1% as a result of the requirements of the Act. Included are estimates of the number of steam electric power units likely to receive exemptions to the requirements of the Act. (NCWQ)
W77-01983

BENEFITS FROM WATER POLLUTION ABATEMENT, BEACH CLOSINGS AND REOPENINGS.
Battelle Memorial Inst., Columbus, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 221, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/77, February, 1975. 673 p. WQ5AC013.

Descriptors: *Beaches, *Benefits, *Swimming, Coasts, Great Lakes region, *Recreation, Forecasting, Federal Water Pollution Control Act, Water Quality, Economics, *Pollution abatement, Water pollution control.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Based on a survey of 3,521 public health agencies in all coastal and Great Lakes states and in a sample of ten inland states, 449 public and private beaches have had water quality problems of varying degrees. Projected water quality improvements as a result of the 1972 Water Pollution Control Act Amendments will increase total useable capacity by an estimated 1.2%-2.7%. Results showed that a maximum of 86% of presently affected beaches may be improved by the Act. Gains in recreational swimming will be primarily concentrated in urban areas. Improved water quality is expected to produce savings in time and travel cost for individuals diverting to closer beaches. Improvement in useable capacity will produce a net gain in total outdoor swimming activity as a result of increased accessability to useable swimming areas. (NCWQ)
W77-01985

BENEFITS FROM WATER POLLUTION ABATEMENT, COASTAL WATERS, (VOLUMES 1 AND 2).
Florida State Univ., Tallahassee. Dept. of Economics.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 172, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/88, April 1976. 617 p. WQ5AC008.

Descriptors: *Coasts, *Benefits, *Oceans, Federal Water Pollution Control Act, Marine fish, *Recreation, Fishing, Economics, Forecasting, Water pollution control, *Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Estimates are made of the incremental benefits which will accrue to commercially harvested marine (coastal and ocean) species and related recreational use of marine species with respect to marine harvestibility, biological productivity and opportunities for mariculture, as a result of the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). If the law is properly implemented, most shellfish areas will be opened by 1980-1985. While the exact response of changes in marine productivity due to projected water quality improvement is not known, it is estimated that catches would increase at a declining rate. Because these water quality improvements will probably influence both mariculture and wild stock equally, no net or differential benefits accrue to mariculture. It is anticipated that improved water quality will increase recreational days fished. Included are regional price and employment impacts estimated to result from the projected increase in commercial catch and recreational fishing days. (NCWQ)
W77-01986

STUDIES ON THE OXIDATION OF ORGANIC SULPHIDES IN KRAFT BLACK LIQUOR,
British Columbia Univ., Vancouver.
F. E. Murray, and C. B. Prakash.
Pulp and Paper Canada, Vol. 77, No. 8, p 47, 49-52, August, 1976. 11 fig, 11 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Odor, *Oxidation, *Sulfides, *Air pollution, Chemical reactions, Kinetics, Pressure, Temperature, Organic compounds, *Pollution abatement.
Identifiers: Dimethyl sulfide, Dimethyl disulfide.

The oxidation of dimethyl sulfide and dimethyl disulfide in kraft black liquor at temperatures of 120-180C and oxygen partial pressures of 1-6 atmospheres was studied in an attempt to assess the effectiveness of this reaction in controlling odors from these compounds. At a partial pressure of 2 atmospheres, the oxidation rates of both compounds increased with temperature and reached a maximum at 160C. As the temperature increased beyond 160C, actual to theoretical oxygen ratio rapidly increased, suggesting that reactions other than the oxidation of organic sulfides were beginning to compete for oxygen usage. Changes in partial pressure at 160C had no effect on oxidation rate; however, at 120C oxidation rate increased with partial pressure increases. Oxygen consumption measurements revealed that a process to oxidize nearly all of the sulfides in black liquor would consume twice the stoichiometric amount of oxygen consumed by sulfur oxidation. In order to reduce the concentration of organic sulfides in black liquor by 90%, an estimated 2 hr would be required for their oxidation in a batch or plug flow reactor; this does not appear to be fast enough for commercial application. (Kreager-FIRL)
W77-02001

WATER HYACINTHS AND ALLIGATOR WEEDS FOR REMOVAL OF SILVER, COBALT, AND STRONTIUM FROM POLLUTED WATERS,
National Space Technology Labs., Bay St. Louis, Miss.
B. C. Wolverton, and R. C. McDonald.
Report No. NASA TM-X-72727, May 1975. 13 p. 16 fig., 4 tab., 3 ref.

Descriptors: *Aquatic plants, *Water pollution treatment, *Heavy metals, Silver, Cobalt, Strontium, Water hyacinth, Alligatorweed, Absorption, Water purification, Mississippi.

Experimentally determined data demonstrate the ability of alligator weeds and water hyacinths to rapidly absorb silver, cobalt, and strontium from waters. Water hyacinths are capable of removing a maximum of 0.439 mg of silver, 0.568 mg of cobalt, and 0.544 mg of strontium in an ionized form from static waters per gram of dry plant weight in a 24-hr period. The growth rate of water hyacinths is approximately 600 kg of dry plant material per hectare (2.47 acres) per day. Therefore, water hyacinths could potentially remove 263.4 g (0.581 lb) of silver, 340.8 g (0.752 lb) of cobalt, and 326.4 g (0.721 lb) of strontium per hectare (2.47 acres) per day provided the metal saturated plants are harvested at regular intervals. Alligator weeds were able to remove a maximum of 0.439 mg of silver, 0.130 mg of cobalt, and 0.161 mg of strontium from lentic waters per gram of dry plant weight per day. (Auen-Wisconsin)
W77-02037

EFFECTS OF POLLUTION ON HUMAN HEALTH,
Environmental Protection Agency, Chapel Hill, N.C. Clinical Studies Branch.
For primary bibliographic entry see Field 6G.
W77-02045

INTRODUCTORY REMARKS ON ENVIRONMENTAL CONTROL STRATEGIES,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 6G.
W77-02048

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION,
Interstate Commission on the Potomac River Basin, Bethesda, Md.
Y. Gordon.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 231-241 and 313-330.

Descriptors: *Planning, *Water pollution sources, *Water pollution control, *Regulation, *Standards, Sediment discharge, Legislation, Forest management, Construction, Mining, Urban runoff, Storm drains, Landfills, Return flow, Agricultural runoff, Economic efficiency, Nuclear powerplants, Acid mine drainage
Identifiers: *Non-point pollution sources.

This panel's generalized discussion considered non-point pollution sources caused by mining, agriculture, silviculture, urban storm runoff, pesticides, construction activities, stream modifications (which may generate downstream erosion and sediment deposition), groundwater contamination by land sludge disposal with the potential for groundwater contamination and uptake by food crops, the lesser impact of nuclear power plants as compared to fossil plants, runoff from uranium mines, and storage of nuclear wastes. The EPA's immediate strategy for reducing non-point pollution stresses prevention by proper management of pollution-causing activities with emphasis on identification, assessment, monitoring, and prediction of the effects on ambient water quality, and investigations of institutional measures which may include the use of 'activity permits.' EPA's long-term strategy involves development, testing, and demonstration of new technological/engineering means of controlling non-point pollution sources; and planning, management, and promoting activities needed to place both the technological and institutional control measures into actual practice. The discussants stressed the lack of knowledge relating to health effects of various pollutants and the difficulty in obtaining sound data as an adjunct to effluent standards. The cost-effectiveness of various technological and institutional control measures, will, in the short-term, remain the main factor; in the long term, ecology will be the governing factor in the extent of pollution control. (Auen-Wisconsin)
W77-02053

PANEL 'C' - TOXIC SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 6G.
W77-02054

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION: NON-POINT SOURCES AND COST EFFECTIVENESS,
Enviro-Control, Inc., Rockville, Md.
P. M. Sprey.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 397-413. 16 tab.

Descriptors: *Water pollution sources, *Pollution abatement, *Cost-benefit analysis, Measurement, Agricultural runoff, Urban runoff, Missouri River, Biochemical oxygen demand, Sediment load, Ammonia, Chemical oxygen demand, Phosphorus, Sewage treatment, Storm runoff, Heavy metals, Adoption of practices.
Identifiers: Non-point pollution sources.

This supplement to the conference provides tables illustrating the per day biological oxygen demand, the sediment load, total dissolved solids, ammonia, chemical oxygen demand, soluble phosphate and total phosphorus load of the Missouri River. Annual BOD budgets at Atlanta, Bucyrus, Cleveland, Washington, D.C., Oakland, Roanoke, Sacramento and San Francisco, assuming 85% removal at sewage treatment plants, and their sources, annual BOD balance, BOD balance during storms, SS balance, and estimated annual heavy metal street loads for Atlanta, Berkeley, Oakland, Sacramento and San Francisco are shown. These are followed with tabulations of cost-effectiveness of BOD removal in dollars per pound, and variations of pollutant inputs as affected by slope and distance. The tabulations are bases for the discussion of the panel on 'Agricultural and Other Non-Point Sources of Water Pollution' related to various agricultural abatement alternatives, such as minimum tillage, side-dressing, slow-release fertilizers, foliar feeding, cover crops, contour plowing, liquid vs. solid fertilizers, and whether their cost-effectiveness can be assessed. Urban non-point loads and abatement alternatives to be considered are sewer separation, treatment at overflow and storm sewers, storage in system and release to treatment plant, new storage, fixing leaks and regulators, bypassing, and sludge disposal, and the variability of their cost-effectiveness. (Auen-Wisconsin)
W77-02057

THE EFFECTS OF WATER POLLUTION FROM NON-POINT SOURCES AS IT RELATES TO THE HEALTH OF MAN,
Health Science Associates, Inc., Bethesda, Md.
M. Ben.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p 415-425.

Descriptors: *Pollutants, *Water pollution effects, *Public health, *Human diseases, Toxins, Chemicals, Pathogenic bacteria, Vectors(Biological), Heavy metals, Viruses, Salmonella.
Identifiers: *Non-point pollution sources.

The pollutants inducing human diseases may be chemical substances (including poisons); pathogenic microorganisms, such as viruses, bacteria, fungi, protozoa, and helminths; and diseases while not truly waterborne are dependent on vectors which are aquatic inhabitants. Most non-point water pollution is generated by industry and agriculture. Carcinogenic contaminants in rain water or carcinogens introduced by natural or i dustrial substances and attached to vegetation incorporated into soil are leached into groun waters. The carcinogenetic effects of arsenic i gestion, barium, cadmium, chromium (as a he avalent ion), polycyclic aromatic hydrocarbo and many other substances have been identifie Ingestion of copper, cyanides, lead, seleniu silver, nitrates induces various disorders, if n direct toxicity, to man. Among the proto-livi agents are viruses, bacteria, protozoa and h minths with a diversity of miscellaneous agen The living and proto-living agents or their toxi principally pollute waters as a result of contamin tion with human effluvia such as feces and uri The primary source, thus, is man with water bei the chief final vehicle of transmission. Anoth link may be in the form of shellfish or other fo organisms or vectors which acquire their contan nants from waterborne human dejecta. A list waterborne pathogens and their epidemiology included. (Auen-Wisconsin)
W77-02058

THE SAGA OF THE ENVIRONMENTAL STA DARD,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 6G.
W77-02060

NATIONAL EFFLUENT STANDARDS,
Environmental Protection Agency, Washingto D C
A. Cywin.
In: Symposium proceedings 'Economics of Clean Environment', January 14-16, 1974, Mit Corporation, McLean, Virginia (Report M-74-2 July 1974), p 461-474.

Descriptors: *Standards, *Federal Water Pollut Control Act, *Industrial wastes, Technology, To ins, Permits, Industries, Feasibility, *Water qua ty standards
Identifiers: *Effluent standards, Zero dischar standards.

The efforts made by the EPA to implement fluent standards in compliance with the 19 Amendments to the Federal Water Pollution Co trol Act are outlined and center on standards a guidelines applicable to existing and new industr dischargers. The requirement of application of t 'best practicable control technology economical achievable, including zero discharges where a propriate' are defined and discussed in applicati to existing industrial effluent sources. For ne sources the legislation prescribes 'the greate degree of effluent reduction achievable throu the application of the best available demonstrat control technology, processes, operating method or other alternatives, including where practicable standard permitting no discharge of pollutant The other standards provided by the Act deal wi toxic pollutant effluent standards based on a list toxic pollutants and centered upon the sort of p lutant rather than the type of discharger; a pretreatment of effluent standards to be applied pollutants which are determined not to susceptible to treatment by public sewage trea ment plants, or which would interfere with th operation. The prescribed terminology and its a plications in 1977 and 1983 are discussed. (Aue Wisconsin)
W77-02061

THE ECONOMICS OF WASTE WATE AQUACULTURE SYSTEMS,
Woods Hole Oceanographic Institution, Mass.
L. J. Smith, and J. E. Huguenin.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-249 5 Price codes: A02 in paper copy, A01 in microfich
In: Institute of Electrical and Electronics E gineers, 1975 Conference 'Engineering in t Ocean Environment OCEAN '75', September 2

25, 1975, p. 285-293. 1 fig., 5 tab., 16 ref. (Reprint Report November 1975). WHOI-SG-04-5-158-8, MIT-SG-04-5-158-1.

Descriptors: *Comparative costs, *Aquaculture, *Sewage effluents, *Heated water, Powerplants, Nutrient requirements, Oysters, Lobsters, Fertilizers, Capital costs, Operating costs, Feasibility, Profit, Income, Costs, Waste water disposal.
Identifiers: Thermal effluents, Seaweed.

The capital and operating costs of a commercial multi-species aquaculture system using secondary treated sewage effluent as a nutrient source, with an option to utilize free heat from power plant effluent are estimated. Four cases are considered, all based on the sewage-aquaculture system developed at the Woods Hole Oceanographic Institution: (1) systems with sewage as a nutrient source and standard heat sources, (2) systems with sewage and free heat from a power plant, (3) syestems with fertilizer as a nutrient source and standard heat sources, and (4) systems with fertilizer and free power plant heat. The design, costs and revenues are scaled up from a basic size by factors of 10, 100, and 1000. The largest of the systems would be able to handle waste water from a city of 100,000 people. Results indicate that despite uncertainties such as land costs, piping of sewage or thermal effluents, elimination of public health hazards, and system location, the larger scale system using sewage as a nutrient source and free heat from a power plant (or located in a warm climate) can be commercially profitable as long as no traditional heat sources are required. (Luedtke-Wisconsin)
W77-02069

METHOD OF EVALUATING THE CONTENT OF NATURAL RADIOACTIVE ISOTOPES OF THE URANIUM AND THORIUM SERIES IN DRINKING WATER AND FOOD, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-02070

HYGIENIC PROBLEMS OF FORECASTING THE QUALITY OF WATER RESOURCES, (IN RUSSIAN),
K. I. Auklov, L. S. Gurvich, P. M. Vindyukov, G. G. Gangardt, and V. F. Petrov.
Gig Sanit 4, p 35-39, (1975).

Descriptors: *Forecasting, *Water quality, Public health, Sanitary engineering.

Water quality evaluation requires consideration of all indices for which contemporary scientific investigations and practice have established the degree and character of their effect on human health and sanitary water use conditions.--Copyright 1976, Biological Abstracts, Inc.
W77-02071

EQUITY MEASURES FOR EXPLORING WATER QUALITY MANAGEMENT ALTERNATIVES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. D. Brill, Jr., J. C. Liebman, and C. S. ReVelle.
Water Resources Research, Vol. 12, No. 5, p 845-851, October 1976. 4 fig, 3 tab, 8 ref.

Descriptors: *Water quality, *Management, *Economic efficiency, *Equity, Constraints, Costs, Alternative planning, Methodology, Optimization, Mathematical models, Systems analysis.
Identifiers: Cost minimization, Delaware Estuary, Waste dischargers, Waste removal costs.

Equity measures are shown to be useful working tools to explore management alternatives for a water quality system. Several example measures of equity are discussed which proved helpful in suggesting new management programs, in identifying critical waste dischargers, in suggesting zones for grouping dischargers, and for understanding given management programs. Given is a review of historical management programs, where the objective is cost minimization. Considered are example equity measures evaluated for Delaware Estuary data utilizing mathematical programming. (Bell-Cornell)
W77-02075

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ESOO1: VERIFICATION OF MODEL FOR NEW YORK HARBOR,
Environmental Protection Agency, New York. Data Systems Branch.
For primary bibliographic entry see Field 5G.
W77-01791

ANNUAL OPERATION OF A COASTAL GROUNDWATER BASIN AT A PRESCRIBED RELIABILITY LEVEL,
Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.
For primary bibliographic entry see Field 4B.
W77-01882

A MODEL STUDY OF THE EFFECTS OF ARTIFICIAL RECHARGE,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W77-01883

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-01884

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W77-01885

MODELE D'AMENAGEMENT ET DE GESTION D'UN GRAND BASSIN HYDROGRAPHIQUE, (A MODEL FOR THE DESIGN AND MANAGEMENT OF A LARGE HYDROGRAPHIC BASIN),
Ecole Nationale Superieure des Mines de Paris, Fontainebleu (France). Center for Geological Information.
For primary bibliographic entry see Field 4A.
W77-01887

IMPACT STUDIES AND THE EVALUATION OF PUBLIC PROJECTS,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 6B.
W77-02062

EQUITY MEASURES FOR EXPLORING WATER QUALITY MANAGEMENT ALTERNATIVES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-02075

6B. Evaluation Process

THE ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM. FIRST YEAR WORK PRODUCT: VOLUME I: THE LEGAL FRAMEWORK: LAKE MICHIGAN AND ITS SHORE,
For primary bibliographic entry see Field 6E.
W77-01689

PLANNING FOR REGIONAL WASTE WATER SYSTEMS,
Massachusetts Dept. of Community Affairs, Boston.
For primary bibliographic entry see Field 5D.
W77-01690

THE RIVER'S REACH. CONNECTICUT RIVER SUPPLEMENTAL FLOOD MANAGEMENT STUDY. OUTDOOR RECREATION IMPACTS. PHASE II. PART V,
Bureau of Outdoor Recreation, Philadelphia, Pa. Northeast Regional Office.
J. J. Comiskey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 005, Price codes: A05 in paper copy, A01 in microfiche. Prepared for the New England River Basins Commission, July 1975. 93 p, 1 fig, 17 maps, 5 tab. CRS-NERBC-BOR 2.1B(4.2.1).

Descriptors: *Non-structural alternatives, *Recreation, *Reservoirs, *Dams, *Flood plains, *Connecticut River, Channels, Government, Planning, New Hampshire, Vermont, Connecticut, Massachusetts, Recreation demand.
Identifiers: *Connecticut River Basin, Ammonoosuc River(NH), Ashuelot River(NH), Sugar River(NH), White River(VT), Passumpsic River(VT), Deerfield River(MA), Beaver Brook(NH).

The potential for meeting recreation needs that are associated with alternative plans proposed to reduce flood damages in the Connecticut River Basin is examined. Both structural and non-structural techniques for flood plain management are proposed. Structural considerations include evaluations of dams and reservoirs; non-structural alternatives include the recreational potential of flood plains and lands adjacent to river channels. Major findings were that 1 of 7 dams proposed by the Corps of Engineers exhibited high degrees of recreation potential, the Bethlehem junction site on the Ammonoosuc River in northern NH. Four dams have moderate potential for recreation: the Honey Hill site on the Ashuelot River in southern NH, the Claremont site on the Sugar River in central NH, the Gaysville site on the White River in central Vermont and the Victory site on the Passumpsic River in northern Vermont. The Meadow site on the Deerfield River in central MA and the Beaver Brook site in southern NH showed little recreation potential. The report concluded that recreation resources in the Connecticut Basin are generally underdeveloped. Estimated future recreation demand cannot be accommodated by present facilities. There is a need for planning and coordination among levels of government and the private sector in the Connecticut Valley to preserve recreation, open space and natural values. (Gentry-North Carolina)
W77-01694

INLAND WATER POLLUTION.
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 5G.
W77-01697

GRAPHIC DISPLAY OF WATER RIGHTS AND WATER RESOURCE INFORMATION FOR THE

YAKIMA RIVER BASIN AS AN AID TO DECISION-MAKING,
Central Washington State Coll., Ellensburg. Dept. of Geography.
J. Q. Ressler.
Completion Report, October 20, 1976. 98 p., 23 fig., 9 tab., 5 append. OWRT A-075-WASH(1). 143-34-10E-3996-5301.

Descriptors: River basins, *Maps, *Social participation, *Graphical methods, Decision making, *Attitudes, *Washington, *Water rights, Surveys, Planning, Aesthetics.
Identifiers: *Citizen participation, *Yakima River basin(Wash).

It is hypothesized that ready availability of graphic displays (maps) of water resource information will stimulate citizens to request the materials and then formulate opinions which will motivate them to participate more fully in the resource planning and allocation decision-making process. Test of the hypothesis was undertaken by preparing maps of water resource and related data, announcing their availability through the news media, and distributing sets of maps accompanied by returnable questionnaires to those who requested the information. Poor response to publicity led to alternative distribution of the materials to a selected list of citizens and persons professionally concerned with resource planning and development. Questionnaires of the first of two sets were returned at a rate of 34%; those from the second set at a lower rate. Conclusions reached from questionnaire analysis are: (1) Professionals are more responsive to availability and receipt of information of this type than are lay persons; (2) To be useful to the lay persons, maps should not be too highly generalized nor data too abstractly displayed; (3) Use of color appears important to holding lay persons' interest; (4) High quality (esthetically pleasing) graphic design has a favorable impact on interest by both lay persons and professionals; and (5) when these conditions exist the probabilities are greater that citizens will be motivated to participate in the resource planning and allocation decision-making process.
W77-01808

ESTIMATION OF AMENITY VALUES AS OPPORTUNITY COSTS FOR ENERGY-RELATED WATER USE IN MONTANA,
Montana State Univ., Bozeman. Dept. of Agricultural Economics.
R. L. Stroup, M. D. Copeland, and R. R. Rucker.
Montana University Joint Water Resources Research Center, Bozeman, Report No. 81, August 1976. 51 p, 4 fig, 2 tab, 41 ref, 2 append. OWRT B-045-MONT(1), 14-34-0001-6027.

Descriptors: *Economics, Recreation, *Fishing, *Recreation demand, Water demand, Costs, Water utilization, *Montana, *Resource allocation, Social values, Attitudes.
Identifiers: *Yellowstone River(Mont), Opportunity costs, Amenity values.

It has become increasingly important that the value of water resources in non-consumptive uses, such as recreation, be quantified. Numerous methods of site evaluation have been attempted--all encountering problems stemming from the use of proxies for consumers' willingness to pay for site use. A fundamentally more direct method is proposed here: a fee experiment. No method of valuing angler access to a limited site can measure the value of fishing in general, fishing on an entire river, the option value of fishing, nor the non-fishing attributes of site conservation. Yet equity, efficiency, and Montana law all require that economic evaluation, of the type obtainable by the proposed study, be made to facilitate rational allocation of resources. A fee experiment for a specific site on the Yellowstone River is specified in detail. This method avoids the problems associated with the use of proxies for consumer willingness to pay. (Stuart-Montana State)
W77-01811

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-01884

MODELE D'AMENAGEMENT ET DE GESTION D'UN GRAND BASSIN HYDROGRAPHIQUE, (A MODEL FOR THE DESIGN AND MANAGEMENT OF A LARGE HYDROGRAPHIC BASIN),
Ecole Nationale Superieure des Mines de Paris, Fontainebleu (France). Center for Geological Information.
For primary bibliographic entry see Field 4A.
W77-01887

FORECASTS AND THE ROLE OF ALTERNATIVE FUTURES,
American Society of Civil Engineers, New York. Div. of Water Resources Planning and Management.
R. C. Tucker.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 365-383, Proceedings paper No. 12578, November 1976. 3 tab.

Descriptors: *Water resources, *Water utilization, *Water demand, *Forecasting, *Planning, Social needs, Water policy.
Identifiers: *Alternative futures, Food industry.

A review of previous water resource forecasts by the Kerr Commission, the Water Resources Council, and the USGS is presented. Comparison among the forecasts indicate widely ranging figures depending on the underlying assumptions. Various factors affecting forecasts are presented along with conceptual problems in forecasting. Rarely have the impacts of alternative policy assumptions, life styles, or technological change been fully considered. Furthermore, forecasts are typically viewed as 'requirements' rather than as 'desires' which must be examined for their benefits and costs. Developing a single 'most likely' forecast is rejected in favor of separate 'alternative futures.' Typical assumptions for various alternative futures are presented encompassing population growth and distribution, food and fiber production, income distribution, national economic efficiency, lifestyle changes, and various means of developing, using, and conserving water resources. (Bell-Cornell)
W77-01890

COLORADO RIVER BASIN DEVELOPMENT AND ITS POTENTIAL IMPACT ON TRIBAL LIFE,
Colorado Univ., Boulder. Dept. of Anthropology.
R. A. Hackenberg.
Human Organization, Vol. 35, No. 3., p 303-311, Fall, 1976. 2 ref.

Descriptors: *Colorado River Basin, *Indian reservations, *Social change, *Social impact, *Economic impact, Federal government, Water policy, Competing uses, Arizona, Water resources development, Irrigation, River basins, Arid lands.
Identifiers: *Papago Indians.

Irrigation, mineral extraction and energy exploitation of the Colorado River Basin have converted a wasteland into potentially one of nation's richest areas. American Indians own a substantial portion of this region, but due to erosion, subnormal rainfall and poor planning of water resources, large portions of reservation land have become unfit for either farming or stockraising. Thus, many Indians have broken ties with the land and moved to cities or to the largest villages on the reservations. Attempts to reverse this pattern and the factors working against its reversal are discussed. It is concluded that the social change in Indian economic values and work habits took place mor rapidly than water resource development. Federa Government programs for Indians have failed i the past because of a lack of understanding of th dimensions of social change and the failure to ap preciate the adverse nature of the total enviror ment. The same mistakes have already been mad in plans for Colorado River Basin developmen Although substantial amounts of wealth will b created within the Indian Reservations it will no for several reasons, be distributed among trib members and there will be no substantial alteratio in the quality of Indian life. (Jamail-Arizona)
W77-01903

BENEFITS FROM WATER POLLUTIO ABATEMENT, BEACH CLOSINGS AN REOPENINGS.
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 5G.
W77-01985

BENEFITS FROM WATER POLLUTIO ABATEMENT, COASTAL WATERS (VOLUMES 1 AND 2).
Florida State Univ., Tallahassee. Dept. o Economics.
For primary bibliographic entry see Field 5G.
W77-01986

FUTURE ENVIRONMENTAL NEEDS AN COSTS,
Virginia Univ., Charlottesville. Dept. of Enviro mental Sciences.
For primary bibliographic entry see Field 6G.
W77-02044

ECONOMICS OF ENVIRONMENTAL CON TROL POLICIES,
Atomic Energy Commission, Washington, D. C Bureau of Licensing.
For primary bibliographic entry see Field 6G.
W77-02047

INTRODUCTORY REMARKS ON ENVIRON MENTAL CONTROL STRATEGIES,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 6G.
W77-02048

ENVIRONMENTALIST VIEW OF 'NON DEGRADATION,' 'BEST PRACTICABL TECHNOLOGY' AND 'BEST AVAILABL TECHNOLOGY',
Sierra Club, Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-02049

INDUSTRIALIST VIEW,
Chamber of Commerce of the United States Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-02050

PANEL 'A' - AUTOMOTIVE EMISSIONS,
For primary bibliographic entry see Field 6G.
W77-02052

IMPACT STUDIES AND THE EVALUATION O PUBLIC PROJECTS,
British Columbia Univ., Vancouver.
W. G. Waters.
Annals of Regional Science, Vol X, No 1, p 9 103, 1975. 4 ref.

Descriptors: *Estimated benefits, *Planning *Evaluation, Economic impact, Social impac Project planning, Alternative planning, Decisio making, Methodology.
Identifiers: *Impact studies, *Evaluation studies.

The different purposes and orientation of impact studies and evaluation studies are contrasted, and their respective roles in the planning and evaluation of public projects are outlined. An impact study is defined as a descriptive, quantitative account of the regional impact of spending on a project. Interactions of various sectors of the economy are identified and reverberations of project spending through subsequent rounds of spending are estimated using multiplier and input-output analysis. An impact study estimates the effects of the project upon projected spending patterns and industrial and demographic trends, but by itself, does not reveal the worth or value of the project to society. In contrast, evaluation studies are intended to assess the relative merits of one project to another. Two major adjustments are necessary for evaluation studies. First, the social or planning objective function must be clearly identified, in order to effectively weigh the contribution of a project's impact toward these objectives. Second, it is necessary to estimate the opportunities foregone, in order to accurately access the true economic costs of a project. (Luedtke-Wisconsin)
W77-02062

SURVEY OF THE CRITICAL NATURAL, HISTORIC AND RECREATIONAL AREAS IN KENTUCKY.
Mayes, Sudderth and Etheredge, Inc., Lexington, Ky.
Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort, Div. of Water Resources, Technical Memorandum, October 1975. 48 p, 3 tab.

Descriptors: *Sites, *Kentucky, *Data collections, *Recreation facilities, Surveys, Mapping, Archeology, History, Parks, Hunting, Camp sites, Scenery, Wildlife habitats, Wild rivers, Forests, Fishing.

Certain categories of historical, natural, and recreational features in Kentucky are identified and displayed graphically (map overlays) to allow water resources planners to be able to consider these areas for preservation and protection. Categories of information covered include: historical sites, covered bridges, archeological sites, state parks, forests and shrines, major local and private parks, wild rivers, historic trails, areas of environmental significance, national parks, wildlife refuges, recreation areas, hunting areas, trout waters, and youth camps. This information was obtained from the Kentucky Departments of Parks, Fish and Wildlife Resources, and Natural Resources, and Environmental Protection, the U.S. Forest Service, Tennessee Valley Authority, Corps of Engineers, and Kentucky Heritage Commission. This data base was compiled as a guide to water resource planners, among others, particularly with respect to conservation of historic and archeological sites. (Luedtke-Wisconsin)
W77-02063

'COMMON PROPERTY' AS A CONCEPT IN NATURAL RESOURCES POLICY,
California Univ., Berkeley. Dept. of Agricultural Economics.
A. V. Ciriacy-Wantrup, and R. C. Bishop.
Natural Resources Journal, Vol 15, p 713-727, October 1975. 38 ref.

Descriptors: *Natural resources, Welfare(Economics), *Management, Decision making, Groundwater, Planning, Fish management, Grazing, Forest management, Resource allocation, Legal aspects, Public rights.
Identifiers: *Common property, Public trust doctrine.

The role of the common property concept and its policy implications as a tool in the economic analysis and solution of natural resources policy problems is examined. Common property is defined as resources subject to the rights of common use, but not to a specific use right held by several owners. The concept is considered as a second level decision system, aimed at maintaining and increasing welfare by continuously influencing decision making on the first level, the operating level, under constantly changing conditions. Whether welfare decreased under common property institutions or whether earlier societies over-used their resources because of common ownership is examined by looking back into economic history. It is concluded that the concept has been capable of satisfactory performance in the management of such natural resources as grazing and forest land. Elements of the common property concept are also being employed currently to solve groundwater and fisheries resource problems. It is suggested that this concept be broadened to include the application of the public trust doctrine to natural resources policy problems. This approach would have the advantage of forcing bureaucracies to take the interests of all common owners into account, and allow quality criteria to be incorporated into resource problem solutions. (Luedtke-Wisconsin)
W77-02064

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EVALUATION OF AGRICULTURAL ADJUSTMENT TO IRRIGATION WATER SALINITY: A CASE STUDY FOR PINAL COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3C.
W77-01909

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, CHEMICAL AND ALLIED INDUSTRIES,
International Research and Technology Corp., Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-01960

CAPITAL MARKETS AND WATER QUALITY NEEDS: 1975-1985.
Conference Board, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-01967

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, PUBLICLY OWNED TREATMENT WORKS, (VOLUMES 1, 2 AND 3).
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W77-01982

THE ECONOMICS OF FISHING AND MODERN CAPITAL THEORY: A SIMPLIFIED APPROACH,
British Columbia Univ., Vancouver. Dept. of Mathematics.
C. W. Clark, and G. R. Munro.
Journal of Environmental Economics and Management, Vol. 2, No. 2, p. 92-106, 1975. 3 fig., 39 ref.

Descriptors: *Econometrics, *Mathematical models, *Fisheries, Optimization, Model studies, Theoretical analysis.
Identifiers: *Capital theory, Optimal control theory.

It is demonstrated that with the aid of optimal control theory, fisheries economics can be cast in a capital-theoretic framework yielding results which are both general and readily comprehensible. Beginning with the Schaefer model, a simple linear autonomous model of optimal fishery management is developed. An optimal stationary equilibrium exists, determined by a golden-rule equation modified by the discount rate and the marginal stock effect. The optimal management policy that emerges is that of adjusting the stock level toward the stationary equilibrium as rapidly as possible. The model is then extended by relaxing, in turn, the assumptions of autonomy and linearity. While the general theoretical development can be readily extended in both cases, the simplicity of the linear autonomous theory is lost because of the emergence of blocked intervals and multiple equilibria complications. These models, while developed for fishing, can be extended to other areas of renewable resource management. (Luedtke-Wisconsin)
W77-02068

THE ECONOMICS OF WASTE WATER-AQUACULTURE SYSTEMS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5G.
W77-02069

6D. Water Demand

WATER IN GENERAL AND ITS INDUSTRIAL USE IN PARTICULAR (ALLGEMEINES UEBER DAS WASSER UND BESONDERES UEBER SEINEN INDUSTRIELLEN GEBRAUCH),
For primary bibliographic entry see Field 3E.
W77-01661

RURAL RESIDENTIAL WATER DEMAND: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Univ., Lexington. Dept. of Agricultural Economics.
O. C. Gruenwald, C. T. Haan, D. L. Debertin, and D. I. Carey.
Water Resources Bulletin of the American Water Resources, Vol. 12, No. 5, p 951-961, October, 1976. 2 fig, 4 tab, 13 ref.

Descriptors: *Water supply, *Water demand, *Water costs, Water utilization, Water wells, Reservoir design, Simulation analysis, Reservoir storage, Data collections, *Kentucky, Prices, Costs, *Simulation analysis, *Econometrics.
Identifiers: *Rural residential water demand, Reservoir capacities, Water use theory.

Data collected from rural water districts in Kentucky shows that rural residential water demand is a decreasing function of price. This finding contests the 'water is different' philosophy and supports the use of demand analysis in water management. Based on simulation analysis, it is concluded that price may be used to reduce reservoir capacity requirements and thus make it possible to meet demands with smaller water supply reservoirs or possibly delay the enlargements of an existing reservoir. Total cost for water supply may be reduced by charging more for the water and building a smaller reservoir. (Heiss-NWWA)
W77-01770

FORECASTS AND THE ROLE OF ALTERNATIVE FUTURES,
American Society of Civil Engineers, New York. Div. of Water Resources Planning and Management.
For primary bibliographic entry see Field 6B.
W77-01890

6E. Water Law and Institutions

ASSESSMENT OF WATER AND RELATED LAND RESOURCES, 1975. INITIAL IDENTIFICATION OF WATER AND RELATED LAND PROBLEMS IN NEW ENGLAND,
New England River Basins Commission, Boston, Mass.

For primary bibliographic entry see Field 6G.
W77-01688

THE ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM. FIRST YEAR WORK PRODUCT: VOLUME I; THE LEGAL FRAMEWORK: LAKE MICHIGAN AND ITS SHORE,
R. L. Wexler, and M. D. Newsom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 135, Price codes: A12 in paper copy, A01 in microfiche. Prepared for the Northeastern Illinois Planning Commission and Coastal Zone Management Program. June 1975. 249 p, 2 append.

Descriptors: *Law, *Legislation, *Coasts, *Lake Michigan, *Illinois, Legal aspects, Government, Ordinances, Statutes, Public law, Coastal engineering, Shore protection, Land use, Land use control.
Identifiers: *Legal analysis, *Legal framework, *Illinois Coastal Zone Management Program, *Coastal Zone Management Act of 1972, *Coastal zone management, Home rule.

Changing concepts of public purpose and benefits as well as the extreme pressures of urbanization in northeastern IL have led to issues and conflicts which have been resolved too frequently in the courts. The intent of this report is to provide a comprehensive legal resource base for the development of a coastal zone management program designed to protect, preserve and enhance Lake Michigan and its shores. The Coastal Zone Management Act of 1972 and the changing role of the Army Corps of Engineers from its narrow 'navigation' orientation to the present one of broader concerns for the environment are described briefly. Based upon examination of hundreds of statutes and judicial opinions, the report identifies 'what the law is' in the context of the critical issues of shore and water, including property rights, the police power, public trust, police power mergers and public trust, governmental organization and authority. In spite of the substantial litigation which has taken place and the numerous statutes that have been passed, a coherent and comprehensive view of the Lake and its environs has not emerged from the actions of the courts and the legislature. Although a summary is presented the authors say 'no summary can adequately verbalize the legal resource basis for the findings which follow. It is critical to full understanding of these findings that the entire report be read and understood by all those who seek to apply the findings to any given situation.' The police power of the state and the doctrine of public trust are seen as important factors in the emerging legal policy for the IL coastal zone. (Hufschmidt-North Carolina)
W77-01689

A REPORT TO THE NEW ENGLAND RIVER BASINS COMMISSION ON NON-STRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGEMENT WITH APPLICATION TO THE CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY. PHASE II. THE FORMULATION AND EVALUATION OF SPECIFIC ALTERNATIVES,
Cheney, Miller, Ellis and Associates, Inc., Putnam, Conn.
For primary bibliographic entry see Field 6F.
W77-01696

INLAND WATER POLLUTION.
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 5G.
W77-01697

PROJECT PROPOSAL FOR SURFACE-MINED LAND ENHANCEMENT (SMILE),
Federal Energy Administration, Washington, D.C. Office of Coal.
For primary bibliographic entry see Field 5G.
W77-01699

THE POTENTIAL USE OF RESERVATIONS TO INTERNATIONAL AGREEMENTS PRODUCED BY THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA,
Louisiana State Univ. Law Center, Baton Rouge.
H. G. Knight.
Sea Grant Reprint No. LSU-R-75-024. Reprinted from Policy Issues in Ocean Law published by West Publishing Company. 53 p, 26 ref. SG-2-35231.

Descriptors: *Law of the Sea, *International Law, *Resources development, Water resources, *International waters, *Pollution abatement, Oceans, Reservation doctrine, Conferences, Planning, Management, Continental Shelf, Natural resources.
Identifiers: *Outer Continental Shelf, Ocean policy, Ocean law, Ocean resources.

The purpose is to identify and discuss issues relating to the possible use of reservations to a treaty or treaties resulting from the Third United Nations Conference on the Law of the Sea. Two different aspects of the issue are examined: the desirability from any particular nation's point of view of its being able to make reservations to a law of the sea treaty or treaties; and the desirability from any particular nation's point of view of other nations being able to make such reservations. United States procedural and policy objectives in the law of the sea negotiations have been used in order to frame the issues and provide a basis for concrete analysis. Part B of this paper identifies those aspects of United States ocean policy which are directly related to the issue of reservations to international agreements. Part C contains a discussion of the use of reservations and the effects which their use might have and Part D discusses some specific 'non-agreement' situations which might emerge from the Third Conference and suggests how reservations might be applied in those situations. (NOAA)
W77-01705

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: CARACAS,
Louisiana State Univ. Law Center, Baton Rouge.
H. G. Knight.
Sea Grant Reprint No. LSU-R-74-028. Reprinted from: Fieldstaff Reports, East Coast-South America Series, Vol 18, No. 1, (Venezuela), October 1974. 18 p, 10 fig, 2 tab, 15 ref, 2 append.

Descriptors: *Conferences, *Law of the Sea, *Oceans, *Resources development, *International law, Water resources, *Pollution abatement, Econmics, Continental Shelf, Planning, Management, Natural resources.
Identifiers: *Outer Continental Shelf, Ocean space, Ocean resources.

This Fieldstaff Report is one of a continuing series on international affairs and major global issues. The first substantive session of the Third United Nations Conference on the Law of the Sea was held in Caracas, Venezuela, from June 20-August 29, 1974. Although widely heralded, it appears to have served little purpose other than to demonstrate the apparent inability or unwillingness of the community of nations to come to grips with the issues and to negotiate acceptable solutions to the critical resource and national security problems spawned by recent technological developments related to the use of the ocean. The precedents set in Caracas may have significant implications for world energy, food, population, and environment issues. No international agreements on law of the sea were negotiated in Caracas, nor was there any appreciable moderation of the polarized nation positions on the many issues under consideratio The issues remain unresolved while technolo and national food and energy crises continue develop. (NOAA)
W77-01706

NEARLY 50,000 NEBRASKA WELLS CAUSIN SOME CONCERN.
For primary bibliographic entry see Field 4B.
W77-01765

A MANUAL OF LAWS, REGULATIONS, A INSTITUTIONS FOR CONTROL OF GROU WATER POLLUTION,
National Water Well Association, Worthingto Ohio.
For primary bibliographic entry see Field 5G.
W77-01776

GRAPHIC DISPLAY OF WATER RIGHTS A WATER RESOURCE INFORMATION FOR T YAKIMA RIVER BASIN AS AN AID TO DE SION-MAKING,
Central Washington State Coll., Ellensburg. De of Geography.
For primary bibliographic entry see Field 6B.
W77-01808

ALTERNATIVES IN AREA MANAGEMENT GROUNDWATER,
Nebraska Univ., Lincoln. Dept. of Agricultu Economics.
For primary bibliographic entry see Field 4B.
W77-01819

COLORADO RIVER BASIN DEVELOPME AND ITS POTENTIAL IMPACT ON TRIB LIFE,
Colorado Univ., Boulder. Dept. of Anthropolog
For primary bibliographic entry see Field 6B.
W77-01903

WATER POLLUTION CONTROL ACT OF 19 COSTS AND CAPABILITIES, WATER TREA MENT SYSTEMS,
American Water Works Association Denv Colo.
For primary bibliographic entry see Field 5D.
W77-01963

NOVEMBER 1975 STAFF DRAFT REPOR REVIEW AND COMMENT,
National Research Council, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-01965

CAPITAL MARKETS AND WATER QUALI NEEDS: 1975-1985.
Conference Board, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-01967

WATER POLLUTION CONTROL ACT OF 19 INSTITUTIONAL ASSESSMENT, DIGEST LEGAL ISSUES.
Bureau of National Affairs, Inc., Washingt D.C. Environment and Safety Research Service
For primary bibliographic entry see Field 5G.
W77-01974

DIRECTORY TO U.S. GEOLOGICAL SURV PROGRAM ACTIVITIES IN COASTAL ARE 1974-76,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2L.
W77-02011

GOVERNMENT VIEW,
For primary bibliographic entry see Field 6G.
W77-02051

UBSTANTIVE RIGHTS UNDER THE NA-IONAL ENVIRONMENTAL POLICY ACT,
yracuse Univ., N.Y. Dept. of Law and Public olicy.
P. Karp.
merican Business Law Journal, Vol. 13, p. 289-14, 1976. 53 ref.

escriptors: *Environmental effects, *Legal eview, *Judicial decisions, *Federal project pol-y, Legal aspects, Legislation.
dentifiers: *National Environmental Policy Act, nvironmental Impact Statements, Calvert Cliffs ase, Overton Park case.

he development of substantive legal review nder the National Environmetal Policy Act NEPA) is traced. Early judicial interpretations ntered on Section 102(2)(c), which set out the rocedural mandates for preparing environmental mpact statements (EIS) considering NEPA only a 'full disclosure' act. This began to change with e Calvert Cliffs case, which not only suggested a view of the agency's decision on its merits, but so established a test by which the court could easure its decision. In the Gillham Dam case hich followed, the court recognized that the EIS as not an end in itself, but a means of using all ractical means to preserve and enhance the en-ronment, as provided in Section 101. The current dicial standard, delineated in the Overton Park se, calls for a review of whether the actual alance of benefits and costs in the EIS or in sup-emental data is arbitrary or gives sufficient eight to environmental values. While court deci-ons based on this standard have quite often been ther general, it is illustrated that the potential for ry specific substantive review exists within sec-ons of NEPA. A major difficulty in the applica-n of the cost-benefit analysis balancing concept the lack of quantifiable environmental values. uedtke-Wisconsin)
77-02067

F. Nonstructural Alternatives

SSESSMENT OF WATER AND RELATED ND RESOURCES, 1975. INITIAL IDENTIFI-ATION OF WATER AND RELATED LAND ROBLEMS IN NEW ENGLAND,
ew England River Basins Commission, Boston, ass.
r primary bibliographic entry see Field 6G.
77-01688

HE RIVER'S REACH. CONNECTICUT RIVER PPLEMENTAL FLOOD MANAGEMENT UDY. OUTDOOR RECREATION IMPACTS. IASE II. PART V,
reau of Outdoor Recreation, Philadelphia, Pa. rtheast Regional Office.
r primary bibliographic entry see Field 6B.
77-01694

ONNECTICUT RIVER BASIN PROGRAM. IASE II. WATER QUALITY IMPACT ALUATIONS ON FLOOD PROTECTION EASURES FOR THE CONNECTICUT RIVER PPLEMENTAL STUDY.
vironmental Protection Agency, Boston, Mass.
r primary bibliographic entry see Field 5G.
77-01695

REPORT TO THE NEW ENGLAND RIVER SINS COMMISSION ON NON-STRUCTURAL EASURES FOR FLOOD PLAIN AND FLOOD AMAGE MANAGEMENT WITH APPLICA-ON TO THE CONNECTICUT RIVER BASIN

SUPPLEMENTAL FLOOD MANAGEMENT STUDY. PHASE II. THE FORMULATION AND EVALUATION OF SPECIFIC ALTERNATIVES,
Cheney, Miller, Ellis and Associates, Inc., Putnam, Conn.
P. B. Cheney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 003, Price codes: A07 in paper copy, A01 in microfiche. Prepared for the New England River Basins Commission, November 1974. 120 p, 2 fig, 39 tab, 51 ref.

Descriptors: *Non-structural alernatives, *Flood plains, *Flood protection, *Flood plain insurance, *Flood proofing, *Warning systems, *Land use, *Land clearing, *Costs, *Benefits, Flood control, Zoning, Land management, Connecticut River.
Identifiers: *Standard Project Flood, *Intermediate Regional Flood, *20-year flood, *50-year flood, 100-year flood, 1000-year flood, *Connecticut River Basin.

The costs and flood damage reduction benefits on non-structural alternatives for flood plain management in the Connecticut River Basin are formulated and evaluated. Three programs were proposed whose management objectives included: (1) Reduce the amount of increasing damages; (2) Prevent increasing damages; (3) Reduce existing damages; (4) Maintain natural storage. Non-structural program elements in Program A and B included land use controls, floodproofing, clearance, flood warning and emergency plans, and flood insurance. The non-structural program elements of Program C included land use regulation, land acquisition, relocation, floodproofing, flood insurance, flood warning system and education and information. Proposals within Program A and B varied when considering a Standard Project Flood or an Intermediate Regional Flood. Similarly Program C varied when considering a 20-year, 50-year or 100-year flood. Total first costs and damage reduction benefits for Program A were $23,755 and $8,529; for B $388,657 and $11,534; and for C $8,706 and $8,028. Benefits did not include non-flood damage benefits, such as open space. Programs A and B which call for relocation and clearance within the 100-year flood plain cannot be justified on the basis of flood damage reduction benefits alone. Program C which applies only to the 20-year flood plain is more likely to be economically feasible because of a smaller land area subject to floods, and may be instituted alone or in conjunction with structural measures. (Gentry-North Carolina)
W77-01696

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL FACTORS OF HUMAN LEUKEMIAS, (IN POLISH),
For primary bibliographic entry see Field 5C.
W77-01562

ASSESSMENT OF WATER AND RELATED LAND RESOURCES, 1975. INITIAL IDENTIFICATION OF WATER AND RELATED LAND PROBLEMS IN NEW ENGLAND,
New England River Basins Commission, Boston, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 614, Price codes: A11 in paper copy, A01 in microfiche. Prepared for the Water Resources Council, Washington, D. C., Technical Memorandum, November 1975. 363 p, 7 fig, 5 tab, 230 ref, 6 append.

Descriptors: *Water management(Applied), *Planning, *Energy, *Water supply, *Water quality, *Recreation, *Finance, *New England, *Connecticut, *New Hampshire, *Vermont, *Massachusetts, *Maine, Groundwater, Institutions, Water treatment, Flood control, *Rhode Island.
Identifiers: *Regional Assessment Advisory Committee, *New England River Basins Commission, *Long Island Sound, *New York-Lake Champlain Drainage Basin, Citizen participation, Urban land uses.

Existing and potential water and land related problems are given for the six New England states, and Clinton and Essex counties in New York, and those portions of Long Island bordering Long Island Sound. States were subdivided along political or hydrological boundaries. For each state an overview is given, followed by brief descriptions of problems of water supply and quality, flooding, drainage, erosion and sedimentation, land use, recreation, preservation of resources and institutional and financing needs regarding water and related lands. A Regional Assessment Advisory Committee, comprised of representatives from states, planning commissions, and federal agencies, provided the expertise in identifying problems. General concerns throughout the region include the following problem issues: impact of energy-related operations on water supplies; intra- or inter-state disagreements over interbasin water transfers; lack of funding for local treatment facilities, flood control, recreation facilities and acquisition or preservation of natural lands; need to coordinate state and local programs to avoid overlapping responsibilities and duplication of effort; the lack of implementation and enforcement of existing programs and laws; and the need for improved resource data acquisition. (Gentry-North Carolina)
W77-01688

RESEARCH NEEDS FOR THE LAKE TAHOE BASIN,
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, Calif.
B. Medford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 486, Price codes: A03 in paper copy, A01 in microfiche. Prepared for the National Science Foundation, December 1974. 29 p, 8 fig. NSF Grant GT-39556.

Descriptors: *Environment, *Air quality, *Water quality, *Land, *Vegetation, *Fish, *Wildlife, *Economic growth, *Recreation, *Resource systems, Eutrophication, Erosion, Sedimentation, Inventory, Planning, California, *Research priorities.
Identifiers: *Environmental management, *Lake Tahoe Basin, Lake Tahoe Area Research Coordination Board.

This tentative assessment of research needs is intended to provide a channel of communication between researchers, sponsors and research users. Trends relating to environmental quality in the Lake Tahoe area are the conflicting use of natural resources, the failure of the market system to account for long-range costs such as pollution, and the democratization of recreation leading to increased demand for recreation opportunities and facilities, and expansion of recreation home ownership. Problems afflicting the Lake Tahoe Basin are: the threat of irreversible water pollution, degradation of the pure air, overdevelopment in places, under-development elsewhere, traffic congestion, crowded facilities, severe seasonal fluctuations in the economy, a shortage of housing in middle and low income categories, uncontrolled erosion, damaged vegetation along highways, and a high frequency of social problems. Six broad categories of research needs are surveyed: air, water, land and vegetation, fish and wildlife, social sciences, and resource systems. (Gentry-North Carolina)
W77-01693

CONNECTICUT RIVER BASIN PROGRAM. PHASE II. WATER QUALITY IMPACT

EVALUATIONS ON FLOOD PROTECTION MEASURES FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass.
For primary bibliographic entry see Field 5G.
W77-01695

ANALYSIS OF MARINE MAMMAL REMOTE SENSING DATA,
Johns Hopkins Univ., Baltimore, Md.
G. C. Ray, and D. Wartzok.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 3-56, April 1976. 1 fig, 10 tab, 24 ref, 5 append.

Descriptors: *Cold regions, *Habitats, *Distrib ion patterns, *Resources development, *Mammals, *Remote sensing, *Baseline studies, *Ecology, Marine animals, Continental shelf.
Identifiers: *Outer Continental shelf, Odobenus rosmarus, Walrus, Balaena mysticetus, Delphinaptarus leucas, Oil development, Oil exploration, Petroleum resources.

This report consists of studies which deal with comparative analyses of data obtained on marine mammals by remote sensing. One study provides a comparison of the accuracy and precision of visual and photographic aerial censuses of ice-inhabiting marine mammals based on results of a simulated flight. Another deals with synergistic remote sensing of walrus and walrus habitats. (Sinha-OEIS)
W77-01825

BASELINE CHARACTERIZATION: MARINE MAMMALS,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
C. H. Fiscus, and H. W. Braham.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 57-119, April 1976. 18 fig, 12 tab, 44 ref. R7120804.

Descriptors: *Continental shelf, *Migration patterns, *Resources development, *Mammals, *Baseline studies, *Cold regions, *Environmental effects, *Ecology, Oil pollution, Water quality, Water pollution, Leases.
Identifiers: *Outer Continental Shelf, Bering Sea, Feeding grounds, *Pinnipeds, *Cetaceans, Seals, Sea lions, Petroleum, Oil development, Oil exploration, Petroleum resources.

The baseline objectives were to identify the kinds of marine mammal species inhabiting the Bering Sea and specifically increase knowledge relevant to the distribution and abundance of pinnipeds and cetaceans. The principal pinneped species inhabiting the Bering Sea are: ringed seal, ribbon seal, largha seal, bearded seal, northern sea lion, and spotted or harbor seal. When the sea ice recedes in the fall, some of these species feed pelagically while others feed near-shore. Many use the sea ice during spring and summer breeding season. The geographic distribution and abundance of all species during these critical periods must be determined, especially as they relate to gas-oil lease sites. Cetaceans frequent the Bering Sea for feeding and migration throughout the year. Times of migration, migration routes, and feeding grounds must be identified for each species before management decisions are implemented with regard to petroleum resource development. (Sinha-OEIS)
W77-01826

ABUNDANCE AND SEASONAL DISTRIBUTION OF MARINE MAMMALS IN THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
C. H. Fiscus, and H. W. Braham.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 121-139, April 1976. 36 ref. R7120806.

Descriptors: *Alaska, *Resources development, *Mammals, *Cold regions, *Environmental effects, *Baseline studies, *Ecology, *Distribution patterns, *Habitats, *Oil industry, *Oil pollution, Hazards, Continental Shelf, Seasonal, Transportation, Water resources.
Identifiers: *Outer Continental Shelf, Oil development, Oil exploration, Petroleum resources, Whales, Seals, Sea lions, Tanker traffic.

The baseline objectives of this project were to provide a better understanding of the relative seasonal distribution and abundance of marine mammal species. These objectives will be accomplished by integrating sighting records taken aboard NAA ships and chartered vessels working in and crossing through the Gulf of Alaska; data from aircraft surveys collected by supporting OCEAP projects (e.g. Alaska Department of Fish and Game); and from historical whaling and sealing records. The northern and coastal regions of the Gulf of Alaska are expected to be important areas where oil-gas research and tanker traffic will occur. These areas also represent localized habitats for many marine mammals (e.g. northern sea lion, Eumetopias jubatus) as well as an area for seasonal migrations (e.g. California gray whale, Eschrichtius robustus). The Gulf of Alaska, therefore, represents an important area of study for understanding the interaction of marine mammal resources and oil-gas resource development. (Sinha-OEIS)
W77-01827

RESOURCE ASSESSMENT: ABUNDANCE AND SEASONAL DISTRIBUTION OF BOWHEAD AND BELUKHA WHALES - BERING SEA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
C. H. Fiscus, and H. W. Braham.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 141-157, April 1976. 1 fig, 1 tab, 22 ref. R7120807.

Descriptors: *Resources development, *Cold regions, *Environmental effects, *Baseline studies, *Ecology, *Oil pollution, *Distribution patterns, *Migration patterns, Leases, Mammals, Water quality, Seasonal, Habitats, Continental Shelf, Hazards.
Identifiers: *Outer Continental Shelf, *Bering Sea, *Population density, Whales, Walruses, Seals, Balaena mysticetus, Delphinapterus leucas, Odobenus rosmarus, Erignathus barbatus, Chukchi Sea, Oil development, *Oil exploration, Petroleum resources.

Proposed oil and gas lease sites occur in the northern Bering Sea west from Norton Sound, and the southern Chukchi Sea west from Kotzebue Sound. Bowhead (Balaena mysticetus) and belukha (Delphinapterus leucas) whales pass through these areas from about March through July and again in the fall. These animals apparently winter in the Bering Sea, although those portions of the population that do are unknown. Calving of bowhead is believed to occur in the northern Bering Sea in May, but again, no reliable data are known to exist. Since adverse affects to these animals could result from oil or gas related perturbations, identification of population center seasonal movements and potential areas production are major considerations in develo ment energy resource management decision (Sinha-OEIS)
W77-01828

ABUNDANCE AND SEASONAL DISTRIBUTIO OF BOWHEAD WHALES AND BELUKHA,
National Marine Fisheries Service, Seattle, Was Marine Mammal Div., and National Marine Fish ries Service, Seattle, Wash. Northwest Fisheri Center.
C. H. Fiscus, W. M. Marquette, and H. W. Braham.
In Environmental Assessment of the Alask Continental Shelf. Principal Investigators' Repo for the Year Ending March 1976. Vol 1. Mari Mammals, p 159-182, April 1976. 2 fig, 2 tab, ref. R7120808.

Descriptors: *Cold regions, *Environmental fects, *Resources development, *Baseline studi *Ecology, *Mammals, *Oil spills, *Oil pollutio *Migration patterns, *Distribution patter Leases, Water quality, Water pollution, Contine tal Shelf, Hazards, Alaska.
Identifiers: *Outer Continental Shelf, Bering Se Whales, Beaufort Sea, Balaena mysticetus, D phinapterus leucas, Ice fronts, Polynya, Feedi grounds, Population management, Oil develo ment, Oil exploration, Petroleum resources.

Bowhead (Balaena mysticetus) and beluk (Delphinapterus leucas) whales are thought to associated with the ice front and polynya syste during the winter in the Bering Sea. They migr northward in the spring to summer feeding areas the Chukchi and Beaufort Seas. These areas areas where animals can be found throughout year, must be defined so that population estima can be obtained providing a basis for evaluat conservation efforts, and to provide informati necessary for management of the populations. Beaufort Sea 'Basin' oil-gas lease sites are in pathway of migrating bowhead and beluk whales. Oil spills and other disturbances of marine environment could drastically aff migrating animals, especially in shore leads, e if pollution is kept local to lease sites. The effe of oil development on the biology and ecology these animals at this critical time in their ann cycle must be evaluated, before any rational lease development plan can be implement (Sinha-OEIS)
W77-01829

MORBIDITY AND MORTALITY OF MARI MAMMALS - BERING SEA,
Alaska Univ., College. Inst. of Artic Biology; Alaska Univ., College. Inst. of Marine Science.
F. H. Fay.
In: Environmental Assessment of the Alask Continental Shelf. Principal Investigators' Repo for the Year Ending March 1976, Vol 1. Mar Mammals, p 183-246, April 1976. 10 fig, 2 tab, ref, append.

Descriptors: *Cold regions, *Environmental fects, *Resources development, *Baseline studi *Ecology, *Mammals, *Mortality, *Oil polluti *Water pollution effects, *Pathology, Alas Continental Shelf, Hazards, Water quality.
Identifiers: *Outer Continental Shelf, Bering S Necropsy, Petroleum resources, Oil developme Oil exploration.

This study was designed to provide baseline in mation on the incidence and causes of patholog conditions in marine mammal populations of Bering Sea that will be useful in evaluating fu impacts of petroleum-related activities in that gion. Primary emphasis is placed on surveys distribution and numbers of beached carcasse moribund and dead animals and on necropsy such specimens for determination of causes of ness and death. (Sinha-OEIS)

/77-01830

IOLOGY OF THE HARBOR SEAL, PHOCA ITULINA RICHARDI, IN THE GULF OF LASKA,
laska Dept. of Fish and Game, Anchorage.
. Pitcher, and D. Calkins.
: Environmental Assessment of the Alaskan ontinental Shelf. Principal Investigators' Reports r the Year Ending March 1976, Vol 1. Marine lammals, p 247-261, April 1976. 2 fig, 5 tab, 10 f. 03-5-022-69.

escriptors: *Cold regions, *Environmental ef-cts, *Resources development, *Baseline studies, Ecology, *Oil pollution, *Mortality, *Mammals, iology, Alaska, Food habits, Growth rates, easonal, Hazards, Continental Shelf.
entifiers: *Outer Continental Shelf, *Harbor als, Phoca vitulina richardi, Population composi-on, Oil development, Oil exploration, Petroleum sources, Trophic relationships.

everal phases of the biology and ecology of the rbor seal in the Gulf of Alaska are investigated. asic objectives include: examination of food bits and trophic relationships; investigation of opulation productivity; and examination of owth, development and seasonal condition. ther objectives include collection of data on opulation composition, seasonal distribution, sex d age segregation and use of critical habitat. ere are a number of potential adverse effects of l and gas development on harbor seal popula-ns. These include: direct injury through contact th oil; disturbance, particularly during vulnera-e periods such as pupping; increased exposure to vironmental contaminants; reduced basic oductivity of the food web; and direct mortality prey species. (Sinha-OEIS)
77-01831

IE NATURAL HISTORY AND ECOLOGY OF IE BEARDED SEAL (ERIGNATHUS BAR-ATUS) AND THE RINGED SEAL (PHOCA USA) HISPIDA),
aska Dept. of Fish and Game, Fairbanks.
J. Burns, and T. J. Eley, Jr.
Environmental Assessment of the Alaskan ntinental Shelf. Principal Investigators' Reports r the Year Ending March 1976, Vol 1. Marine ammals, p 263-294, April 1976. 4 fig, 6 tab, 37 . 03-5-022-53.

scriptors: *Cold regions, *Environmental ef-cts, *Resources development, *Baseline studies, cology, *Mammals, *Oil pollution, Alaska, bitats, Ecosystems, Water quality, Water pollu-n, Hazards, Continental Shelf, Marine animals, a ice.
ntifiers: *Outer Continental Shelf, Seals, arded seals, Ringed seals, Erignathus barbatus, oca(Pusa) hispida, Bering Sea, Chukchi Sea, aufort Sea, Oil development, Oil exploration, troleum resources.

nged seals, Phoca hispida and bearded seals, gnathus barbatus are major components of the rine mammal fauna of the Bering, Chukchi and aufort Seas. The broad objectives of this pro-t are to obtain baseline information about the ural history and ecology of ringed and bearded ls. These species occupy vastly different ological niches within the ice dominated marine stems in question. The ringed seal is a small, dely distributed and very abundant species ich mainly occurs in areas of extensive, rela-ely thick and stable sea ice. Ringed seals feed inly on zooplankton, the smaller shrimp and nersal fishes. Bearded seals are the largest of northern seals, are widely distributed, but cur in the drifting ice. They feed almost exclu-ely on benthic organisms. The implications with pect to oil and gas development are basically t we will be able to recognize how, when, ere and why certain activities may have prox-imal or ultimate effects on these two important species. (Sinha-OEIS)
W77-01832

AN AERIAL CENSUS OF SPOTTED SEALS, PHOCA VITULINA LARGHA,
Alaska Dept. of Fish and Game, Fairbanks.
J. J. Burns, and S. J. Harbo, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 295-302, April 1976. 14 ref. 03-5-022-53.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Census, *Population, Alaska, Distribution patterns, Leases, Marine animals, Continental Shelf, Hazards.
Identifiers: *Outer Continental Shelf, Aerial surveys, Spotted seals, Phoca vitulina largha, Ice fronts, Bering Sea, Oil development, Oil exploration, Petroleum resources.

The distribution and density as well as the size of the population of the spotted seal, Phoca vitulina largha, are determined. Spotted seals, which are a major component of the Bering Sea marine mammal fauna, are mainly restricted to the ice front during late winter and spring. This distribution means that they are concentrated in three proposed lease areas: Bristol Bay, St. George Basin and Navarin Basin. A baseline assessment of distribution and total number of these seals constitutes part of the information required to evaluate the potential impact of OCS oil and gas development along the edge of the Bering Sea Continental Shelf. (Sinha-OEIS)
W77-01833

TROPHIC RELATIONSHIPS AMONG ICE INHABITING PHOCID SEALS,
Alaska Dept. of Fish and Game, Fairbanks.
L. F. Lowry, and J. J. Burns.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 303-332, April 1976. 1 fig, 5 tab, 26 ref. 03-5-022-53.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Water pollution effects, Diets, Leases, Population, Food habits, Alaska, Continental Shelf, Hazards.
Identifiers: *Outer Continental Shelf, Trophic relationships, Phocid seals, Foraging, Ice habitats, Bering Sea, Chukchi Sea, Beaufort Sea, Ringed seals, Pinnipeds, Phoca(Pusa) hispida, Phoca vitulina largha, Phoca(Histriophoca) fasciata, Erignathus barbatus, Oil development, Oil exploration, Petroleum resources.

Ice inhabiting seals are highly visible, numerous and economically and sociologically important species in the Bering, Chukchi, and Beaufort marine ecosystems. A complete understanding of the role of these seals in the trophic structure of these ecosystems is crucial to the evaluation of potential impacts of OCS development. As a first step, the important items in the diet of each species in all areas at all times of year must be determined. Key areas and times of foraging must be determined and will have direct bearing on the suitability of various areas for leasing. When key prey species have been enumerated and data correlated with information on the distribution, abundance and natural history of these prey species (from other projects), an evaluation of effects of OCS development on the food base of the seals can be made. By understanding the trophic relationships among ice inhabiting seals and other consumers in the system, indirect effects of OCS development (e.g. those favoring population increase of potential food resource competitors) can be estimated. (Sinha-OEIS)
W77-01834

ASSESSMENT OF THE DISTRIBUTION AND ABUNDANCE OF SEA OTTERS ALONG THE KENAI PENINSULA, KAMISHAK BAY AND THE KODIAK ARCHIPELAGO,
Alaska Dept. of Fish and Game, Fairbanks.
K. B. Schneider.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 333-358, April 1976. 9 fig, 4 tab, 11 ref. 03-5-022-69.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Otters, *Distribution patterns, *Water pollution effects, Aquatic population, Alaska, Population, Hazards, Continental Shelf.
Identifiers: *Outer Continental Shelf, Sea otters, Kenai Peninsula, Kodiak Archipelago, Oil development, Oil exploration, Petroleum resources.

Aerial and boat surveys were conducted around the Kenai Peninsula and the Kodiak Archipelago to determine the present distribution and relative abundance of sea otters. Sea otter populations in these areas are relatively small but are expanding their range. The potential for adverse impacts of OCS activities on sea otters appears high. Sea otters are more vulnerable to direct oiling than any other species of marine mammal and they may be indirectly affected by chronic low levels of pollution through the food chain. Where populations are expanding their range, a localized influence could retard repopulation of large areas. Sea otters exert a significant impact on nearshore marine communities. It is necessary to consider the history of sea otter occupation of an area when studies of these communities are conducted. Information being gathered under this project will be used to trace the patterns of range expansion, predict future trends, identify those areas where OCS activities would have greatest impact on the population and provide a basis for evaluating the sea otter's role in changes in marine communities. (Sinha-OEIS)
W77-01835

DISTRIBUTION AND ABUNDANCE OF SEA OTTERS IN SOUTHWESTERN BRISTOL BAY,
Alaska Dept. of Fish and Game, Fairbanks.
K. Schneider.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 359-369, April 1976. 1 fig, 1 tab, 5 ref. 03-5-022-69.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Otters, *Distribution patterns, Leases, Population, Hazards, Alaska, Continental Shelf.
Identifiers: *Outer Continental Shelf, Sea otters, Bristol Bay, Alaska Peninsula, Unimak Island, Oil development, Oil exploration, Petroleum resources.

A large population of sea otters occupies approximately 3000 square miles of habitat north of Unimak Island and the Alaska Peninsula. At present the approximate distribution of the population is known but no reliable estimates of its size are available. Sea otters are particularly vulnerable to the direct effects of oiling and may be indirectly affected through the food chain by chronic low levels of pollution. This population inhabits waters in and around proposed OCS lease areas. The objective of this project is to systematically survey the range of population to determine the distribution of sea otters and estimate their numbers. The survey should provide a basis for designating critical areas and for monitoring changes in distribution and numbers. (Sinha-OEIS)

W77-01836

POPULATION ASSESSMENT, ECOLOGY AND TROPHIC RELATIONSHIPS OF STELLER SEA LIONS IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
D. Calkins, and K. Pitcher.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 371-386, April 1976. 2 fig, 4 tab, 26 ref. 03-5-022-69.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, Distribution patterns, *Pathology, *Water pollution effects, Food habits, Hazards, Alaska, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Trophic relationships, Gulf of Alaska, Population assessment, Steller sea lions, Eumetopias jubatus, Oil development, Oil exploration, Petroleum resources.

The investigation of Steller sea lions (Eumetopias jubatus) in the Gulf of Alaska is a broadly based undertaking designed to provide basic information about population status, distribution, movement patterns, segregation, use of critical habitat, population composition and dynamics, growth, pathology, food habits and trophic relationships. The sea lion is a dominant high level carnivore in the marine system of the Gulf of Alaska. Oil and gas exploration and development have the potential of greatly affecting basic productivity and the abundance of prey species. Therefore the importance of establishing trophic relationships is evident. Oil and gas exploration and development could possibly increase levels of various environmental contaminants which are concentrated in top-level consumers such as the sea lion. Baseline levels should be established. (Sinha-OEIS)
W77-01837

THE RELATIONSHIPS OF MARINE MAMMAL DISTRIBUTIONS, DENSITIES AND ACTIVITIES TO SEA ICE CONDITIONS,
Alaska Dept. of Fish and Game, Fairbanks.
J. J. Burns, L. H. Shapiro, and F. H. Fay.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 387-430, April 1976. 15 fig, 21 ref. 03-5-022-55.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Sea ice, *Water pollution effects, *Leases, Alaska, Ice cover, Habitats, Population, Migration, Hazards, Biology, Continental Shelf.
Identifiers: *Outer Continental Shelf, Bering Sea, Chukchi Sea, Beaufort Sea, Seals, Spotted seals, Ribbon seals, Polar bears, Walrus, Whales, Oil development, Oil exploration, Petroleum resources, Ursus maritimus, Odobenus rosmarus, Phoca vitulina largha, Phoca hispida, Phoca fasciata, Erignathus barbatus, Delphinapterus leucas, Balaena mysticetus.

Petroleum development in the Bering, Chukchi and Beaufort seas will, without exception, take place in regions of seasonal sea ice cover in which ice-associated marine mammals occur abundantly and are involved in major annual biological events. As examples, proposed lease areas in Bristol Bay, St. Gerge Basin and Havarin Basin are in areas seasonally covered by the ice front in which spotted and ribbon seals concentrate in winter to give birth and nurture their pups. The Hope Basin is within the migration route of all ice-associated marine mammals which winter in the Bering Sea. The Beaufort Sea lease area is occupied by ringed seals and polar bears almost all year. The relevance of this project to problems of petroleum development is that we are attempting to determine what major recognizable marine mammal habitats exist; how these habitats are spatially and temporally distributed; to what extent the various mammal species depend on them and how important aspects of the biology of marine mammals are related to the physical changes in a major component of their environment - ice. The answers to these questions are necessary in order to determine what species are likely to be affected by development, in what numbers and to some extent, how. (Sinha-OEIS)
W77-01838

ENVIRONMENTAL ASSESSMENT OF THE BERING SEA: BENTHIC BIOLOGY,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder, G. Mueller, S. C. Jewett, M. Hoberg, and K. Hafliner.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 5. Fish, Plankton, Benthos, Littoral, p 1-218, April 1976. 3 fig, 6 tab, 44 ref, 3 append. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Benthos, *Oil spills, *Oil pollution, *Water pollution effects, Data collections, Sedimentation, Alaska, Continental Shelf, Invertebrates, Mortality.
Identifiers: *Outer Continental Shelf, *Bering Sea, Trophic relationships, Echinoderms, Indicator species, Oil development, Oil exploration, Petroleum resources.

The operations connected with oil exploration, production, and transportation in the Bering Sea present a wide spectrum of potential dangers to the marine environment. The benthic biological program in the Bering Sea during its first year emphasized the development of a qualitative and quantitative inventory of species as part of the overall examination of the biological, physical and chemical components of those portions of the shelf slated for oil exploration and drilling activity. In addition, development of computer programs in the Gulf of Alaska, designed to quantitatively assess assemblages of benthis species on the shelf there, are applicable to the Bering Sea. The effects of oil pollution on subtidal benthic organisms have been seriously neglected, although a few studies, conducted after serious oil spills, have been published. Infaunal benthic organisms tend to remain in pace and consequently can be useful as an indicator species for disturbed areas. Data indicating the effects of oils on most subtidal benthic invertebrates are fragmentary. A direct relationship between trophic structure (feeding type) and bottom stability has been demonstrated. A diesel-fuel oil spill resulted in oil becoming adsorbed on sediment particles with the resultant mortality of many deposit feeders living on sublittoral muds. Bottom stability was altered with the death of these organisms, and a new complex of species became established in the altered substratum. Many members of the infauna of the Bering Sea are deposit feeders; thus, oil-related mortality of these species could result in a changed near-bottom sedimentary regime with alteration of species. (Sinha-OEIS)
W77-01839

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF THE WESTERN BEAUFORT SEA BENTHOS,
Oregon State Univ., Corvallis. School of Oceanography.
A. G. Carey, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 5. Fish, Plankton, Benthos, Littoral, p 219-255, April 1976. 6 fig, 38 ref. 03-5-022-68.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Benthos, *Oil spills, *Oil pollution, *Water pollution effects, Alaska, Continental Shelf, Distribution patterns, Ice cover, Data collections, Coasts, Hazards.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, Oil development, Oil exploration, Petroleum resources.

Extensive drilling for oil and gas on the Alaskan and Canadian North Slope creates the potential for high environmental pollution and degradation of the coastal area. The basic structure of the coastal ecosystem could be adversely affected in local areas, and the food web disrupted by oil spills toxic to phytoplankton, the primary producers and to zooplankton (including larvae of benthic invertebrates). In the inner shelf environment, the bottom could be a sink for heavier oils, and perhaps include large amounts of toxic volatiles because of the colder temperatures found in the Beaufort Sea. Coastal benthic fauna could have high mortalities caused by a spill so carnivores, including fish, whales, seals, and polar bears, would find less to feed on. Summaries and data analysis of the present and future assembled material on the benthos in the Beaufort Sea will provide a basis for evaluating the potential effects of possible oil spills and general environmental pollution caused by the necessary supportive activities of man in this relatively unspoiled environment. (Sinha-OEIS)
W77-01840

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE, AND LIFE HISTORIES OF BENTHIC ORGANISMS,
Oregon State Univ. Corvallis. School of Oceanography
A. G. Carey, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 5. Fish, Plankton, Benthos, Littoral, p 257-712, April 1976. Numerous charts and tables. Includes bibliography p 608 703 and p 709 711. 03-5-022-68.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Benthos, *Oil spills, *Oil pollution, *Water pollution, effects, Alaska, Bibliographies, Life history studies, Data collections, Continental Shelf, Hazards.
Identifiers: *Outer Continental Shelf, Beaufort Sea, North Slope, Oil development, Oil exploration, Petroleum resources.

The western Beaufort Sea has not been extensively sampled until recently. The objectives of this effort are to summarize existing published and unpublished work and to infer conclusions about the species composition and distribution of the benthos. The natural variability that exists will also be estimated, and the control that environmental conditions have on the ecosystem will be investigated, using correlations of the environmental variables and species abundance information. Life histories of the dominant species and their reproductive activity are important aspects when assessing particular times of the year, development stages when organisms are especially vulnerable to pollutants, and in estimating the capacity to repopulate an area. These objectives will establish a reference state from which future studies may evaluate deviations, and determine the impact of oil and gas development on the benthic component of the ecosystem. The report compiled to date on the summarization and analysis of existing literature and unpublished data on the distribution, abundance, and life histories of benthic organisms of the Beaufort Sea are included. (Sinha-OEIS)
W77-01841

UTER CONTINENTAL SHELF ASSESSMENT ROJECT. HERRING SPAWNING SURVEY - OUTHERN BERING SEA,
laska Dept. of Fish and Game, Kodiak.
B. Jackson, and I. M. Warner.
: Environmental Assessment of the Alaskan ntinental Shelf. Principal Investigators' Reports r the Year Ending March 1976, Vol 6. Fish, ankton, Benthos, Littoral, p 1-16, April 1976. 1 b, 1 fig, 3 ref.

escriptors: *Resources development, nvironmental effects, *Baseline studies, *Cold gions, *Ecology, *Habitats, *Oil spills, *Oil pol- ion, *Water pollution effects, Herring, awning, Marine fish, Distribution patterns, aska, Continental Shelf.
entifiers: *Outer Continental Shelf, *Bering a, Pacific herring, Clupea pallasii, Smelt, meridias, Capelin, Mallotus villoseis, Chukchi a, Oil development, Oil exploration, Petroleum ources.

e spawning ground utilization by forage fishes the Bering Sea, principally, the Pacific herring upea pallasii), and capelin (Mellotus villoseis) is estigated. The current state of knowledge is lar- y generalized in nature with little completed rk in relation to the physical habitat of either ecies. The northernmost extension of Pacific ring currently known is Cape Thompson in the ukchi Sea, while Capelin and boreal smelt smerus eperlanus) are known to occur north of marcation Point near the Alaska-Canadian rder in the Beaufort Sea. Herring spawning ac- ties were seen and documented in FY 76 within study area. Habitat types were recorded for fu- e surveys. Osmerids are thought to be more im- tant as spawners between Ugashik Bay and e Sarichef on the north Alaska peninsula. reign fishing harvest levels were investigated discussed. Interviews were conducted with stal residents to determine magnitude of forage es within the villages socio/economic needs. ha-OEIS)
7-01842

TER CONTINENTAL SHELF ASSESSMENT OJECT. RAZOR CLAM HABITAT SURVEY - LF OF ALASKA,
ska Dept. of Fish and Game, Kodiak.
. Kaiser, and D. Konigsberg.
Environmental Assessment of the Alaskan tinental Shelf. Principal Investigators' Reports the Year Ending March 1976, Vol 6. Fish, kton, Benthos, Littoral, p 17-31, April 1976. 4 l tab, 6 ref.

criptors: *Resources development, vironmental effects, *Baseline studies, *Cold ons, *Ecology, *Habitats, *Oil spills, *Oil pol- n, *Water pollution effects, Alaska, Clams, ches, Distribution patterns, Continental Shelf.
tifiers: *Outer Continental Shelf, Gulf of ska, Pacific razor clams, Siliqua patula(Dixon), development, Oil exploration, Petroleum urces.

study of the Pacific razor clam, Siliqua patula on), is being undertaken to define the extent ne razor clam populations in the Gulf of Alaska veen Unimak Bight and the 139 deg West lon- de. The importance of the Pacific razor clam t be considered in terms of recreational and mercial utilization prior to any petroleum elopment along the Gulf coast. Most of the im- ant known razor clam beaches are near areas current or proposed oil development. The tat of this species on the open surf swept y beaches of the coast make it highly vulnera- o problems associated with oil exploration and elopment. (Sinha-OEIS)
-01843

ESCRIPTION AND NUMERICAL ANALYSIS THE FACTORS AFFECTING THE

PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
G. C. Anderson, R. K. Lam, and B. Booth.
In: Environmental Assessment of the Alaskan Continetal Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 6. Fish, Plankton, Benthos, Littoral, p 35-58, April 1976. 6 fig, 1 tab, 74 ref. NOAA-03-5-022-67.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Oil spills, *Oil pollution, *Water pollution effects, Alaska, Primary productivity, Data collections, Continental Shelf.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Oil development, Oil exploration, Petroleum resources.

This study emcompasses the pelagic ecosystem in the Gulf of Alaska, concentrating on the first step of the food chain. The specific objectives are: to search the existing literature and unpublished data in order to compile baseline information on factors of importance to phytoplankton production; to synthesize the baseline information into a description of the seasonal and geographic distribution of phytoplankton standing stock, production and related physical and checmical factors insofar as the existing data are suitable; to use the data to initialize a numerical model and to determine the combinations of process submodels which lead to distributions in the dependent variable that are in agreement with observations; and to test the sensitivity of the results of the 'standard' run to changes in the submodels and independent variables. The results of this study may then be used to compare effects after petroleum development with the natural range of values in the pelagic ecosystems and the types of modifications to the plant community which might be associated with a large scale oil spill can be suggested. The effects of an oil spill on the productivity of underlying waters would be short term effects. There is also a possibility of long term effects of petroleum development in the Gulf of Alaska. One would be the introduction of different oil fractions into the food chain. Some of these fractions may not be toxic or organisms low on the food chain, but could be toxic to man. (Sinha-OEIS)
W77-01844

REVIEW OF LITERATURE AND HISTORICAL DATA ON NON-SALMONID PELAGIC FISHERIES RESOURCES OF THE EASTERN BERING SEA AND GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. T. Pereyra, and M. O. Nelson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 6. Fish, Plankton, Benthos, Littoral, p 59-73, April 1976. 3 append. R7120811 and R7120812.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Oil spills, *Oil pollution, *Water pollution effects, *Fisheries, Alaska, Distribution patterns, Bibliographies.
Identifiers: *Outer Continental Shelf, Pelagic fisheries, Literature searches, Fisheries resources, Bering Sea, Oil development, Oil exploration, Petroleum resources.

The research to date indicates significant amounts of information are available for relatively few species and that, aside from the compilation of occurrence records for a variety of relatively rare species, the study will focus on approximately 20 species. This study is expected to provide the only organized review and synthesis of information available on the subject species in the area of concern. Approximately 600 references on non-salmonid pelagic fishes have been located and examined. Of these, approximately 430 were of indirect value, 225 were found to contain information useful to the narrative report and about 100 will be included in the annotated portion of the bibliography. (Sinha-OEIS)
W77-01845

BASELINE CHARACTERIZATION, LITTORAL BIOTA, GULF OF ALASKA AND BERING SEA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.
S. T. Zimmerman, and T. R. Merrell, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 6. Fish, Plankton, Benthos, Littoral, p 75-584, April 1976. 17 fig, 7 tab, 10 append. Chiefly data tables and references.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Oil spills, *Oil pollution, *Water pollution, *Water pollution effects, *Distribution patterns, Alaska, Littoral biota, Habitats, Fisheries, Toxicity, Bibliographies, Continental Shelf.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Intertidal biota, Subtidal biota, Oil development, Oil exploration, Petroleum resources.

A general characterization and inventory of the intertidal and shallow subtidal biota in the region from Yakutat in the eastern Gulf of Alaska to Cape Newenham in northern Bristol Bay is provided. Two objectives in the study were: to determine the distribution of the major habitat types (sandy, muddy, rocky, etc.) along the coastline; and to determine the densities and distribution of biotic populations within these habitat types. The distribution of organisms within habitat types is being determined by field parties from the Auke Bay Fisheries Laboratory (ABFL), with logistical assistance from the Pacific Marine Center. Additional projects include an extensive literature survey, a study of the accumulation of biotic debris in the 'drift zone,' the estimation of variability between sampling areas, and more intensive studies at sites which may receive major impact from oil exploration in the eastern Gulf of Alaska. The intertidal and shallow subtidal areas provide one of the major points of contact between floating or dissolved pollutants and the marine substrate. The majority of biota in these areas are non-motile and are unable to avoid repeated exposure as oil or similar compounds come ashore. In addition to the obvious problems of suffocation or acute toxicity, other effects may occur. For instance, removal of littoral populations may cause changes in the feeding patterns of marine birds and mammals. It may also change the reproductive potential of certain marine fishes. (Sinha-OEIS)
W77-01846

PLANKTON OF THE GULF OF ALASKA - ICHTHYOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English.
In: Environmental Assessment of the Alaska Continental Shelf, Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 1-30, April 1976. 3 fig, 11 tab. 03-5-022-67-TA8 No. 4.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Distribution patterns, *Plankton, Alaska, Fish eggs, Oil pollution, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Ichthyoplankton, *Fish larvae, Gulf of Alaska, Oil exploration, *Oil development, Petroleum resources.

This report provides information on the seasonal density distributions and environmental requirements for principal species of ichthyoplankton in

the Gulf of Alaska. Details are given on the data collections, station locations. Summaries are given of the taxonomic categories of fish eggs and fish larvae found during the various survey cruises. Baseline studies should provide the frame reference to determine the effects of resources development on the outer continental shelf, in particular with reference to oil and gas developmental activities. (Sinha-OEIS)
W77-01847

INITIAL ZOOPLANKTON INVESTIGATIONS,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
D. M. Damkaer.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 31-56, April 1976. 5 fig, 3 tab.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Continental Shelf, *Zooplankton, Alaska, Vertical distribution, Distribution patterns.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Prince William Sound, Oil exploration, Oil development, Petroleum resources.

Zooplankton was sampled during two cruises to the northern Gulf of Alaska: in Prince William Sound in October, and on the continental shelf in November 1975. The zooplankton studies are part of a comprehensive environmental assessment of the Alaskan shelf, in light of present and future offshore petroleum resource development. The fauna of the subarctic Pacific region is not particularly diverse, when compared to warm-water plankton. About 100 species from the fall and early winter were identified. During late 1975, the most common zooplankton species were found to have vertical distributions fitting into four basic patterns, including an important group of species that spend the day in deep water, and rise into the surface layer at night. If pollutants are introduced into the surface layers, the pollutants may not be contained, but could quickly be transferred to deeper water by these active migrations. (Sinha-OEIS)
W77-01848

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY IN THE NORTHEAST GULF OF ALASKA,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
J. D. Larrance.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 57-93, April 1976. 6 fig, 3 tab, 14 ref.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effect, *Oil pollution, *Continental shelf, *Phytoplankton, *Primary productivity, *Alaska, Diatoms, Light intensity.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Standing stocks, Silicoflagellates, Skeletonema costatus, Dictyocha fibula, Thalassionema nitzschioides, Fragillariopsis sp., Oil exploration, Oil development, Petroleum resources.

The chief objective of the phytoplankton and primary productivity studies in the Gulf of Alaska for the first year of OCSEAP was to provide a baseline of phytoplankton standing stocks and rates of primary production. The investigations were also intended to identify the environmental factors controlling production and to determine quantitative relationships between these factors and production. The baseline includes the species compositions and population densities of the the phytoplankton, rate of carbon assimilation, nutrient concentrations, intensity of light available to the cells, concentrations of chlorophyll a and phaeopigments, and other related variables. The chief environmental factor controlling production appeared to be light available to the cells. Nutrient concentrations were sufficient to sustain vigorous phytoplankton growth. Dominant groups showing distinct distributions included a silico-flagellate, Dictyocha fibula, and the diatoms Thalassionema nitzschioides, Fragillariopsis sp., and Skeletonema costatus. Repopulation of phytoplankton following damaging contamination may result in a species composition much different than the previous one. Productivity may also be significantly different than previous levels. (Sinha-OEIS)
W77-01849

ZOOPLANKTON AND MICRONEKTON STUDIES IN THE BERING -CHUKCHI/BEAUFORT SEAS,
Alaska Univ., College. Inst. of Marine Science.
R. T. Cooney.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 95-161, April 1976. 13 fig, 2 tab, 7 ref, 2 append. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Continental shelf, *Zooplankton, Alaska, Trophic levels.
Identifiers: *Outer Continental Shelf, Bering Sea, Bristol Bay, Micronekton, Species composition, Oil exploration, Oil development, Petroleum resources.

Details of progress and results from field studies initiated in May-June 1975, as one part of the overall BLM/NOAA environmental assessment of Alaska's continental shelf are given. The distribution, abundance, and species composition of the zooplankton and micronekton communities of the southeastern Bering Sea are discussed in as much detail the data set permits, with emphasis on the late summer season. A well-defined 'discontinuity' in species composition appears at mid-shelf in central Bristol Bay; few oceanic species are encountered as adults, but east of this location larvae and juveniles are present. It is surmised that physical oceanographic measurements taken at this time but not yet available will substantiate the presence of a boundary feature at this location. Since the zooplankton community includes the early life history forms of most commercially valuable subsistence species in the Bering Sea and provides forage for higher trophic levels, the implications of offshore oil development are certainly obvious. Critical times of year, locations, and biological associations which define the 'survival windows' for selected species must be understood before hypotheses describing the most probable impact can be structured. (Sinha-OEIS)
W77-01850

PHYTOPLANKTON STUDIES - BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
V. Alexander.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 163-210, April 1976. 11 fig, 5 tab. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Continental Shelf, *Phytoplankton, *Food chains, Alaska, Ice cover, Population.
Identifiers: *Outer Continental Shelf, Bering Sea, Ice pack, Oil exploration, Oil development, Petroleum resources.

The principal task involved was the study of th dynamics of phytoplankton populations, particu larly along the edge of the seasonal ice-pack in th Bering Sea, and with emphasis on describing th probably effects of petroleum development in pact. The southeastern Bering Sea is a highl productive area in terms of fisheries, and as suc is very important to the Alaskan economy. In add tion, the Bering Sea shelf as well as the southeas shelf-break area supports large populations o birds and mammals. The phytoplankton primar productivity which supports all the activity highe in the food chain is high seasonal in this area, an its timing and the mechanisms of food chai transfer are probably extremely important t maintaining the integrity of the system. It is esse tial that the exact nature of the highly season phytoplankton production peaks is known, th major pathways and rates of transfer of this foo chain base to higher levels is understood. (Sinh OEIS)
W77-01851

BASELINE STUDIES OF DEMERSA RESOURCES OF THE NORTHERN GULF O ALASKA SHELF AND SLOPE: AN HISTOR CAL PREVIEW,
National Marine Fisheries Service, Seattle, Was Northwest Fisheries Center.
W. T. Pereyra, L. Ronholt, and S. Hughes.
In: Environmental Assessment of the Alaska Continental Shelf. Principal Investigators' Repor for the Year Ending March 1976, Vol 7. Fis Plankton, Benthos, Littoral, p 211-217, April 197

Descriptors: *Resources developmen *Environmental effects, *Baseline studies, *Co regions, *Ecology, *Water pollution effects, *C pollution, *Continental Shelf, Alaska, *Demers fish, Growth rates, Fishes, Shellfish.
Identifiers: *Outer Continental Shelf, Gulf Alaska, Age composition, Oil exploration, development, Petroleum resources.

The objectives are to provide an historical p spective on the demersal fish and shellfi resources residing in the continental shelf a slope waters of the Gulf of Alaska between t Semidi Islands (157 degrees W. long.) and Yaku Bay (140 degrees W. long.) and to provide grow and age composition information on select demersal fish species of importance to man food resources. The field data collected in 1975 distribution of demersal fish and shellf resources has been analyzed so that it may compared with the results of earlier surveys. the age structures (about 5,000) collected from species of demersal fishes in 1975 have been re by the Age Determination Unit of the Northw Fisheries Center; the information has been ente on ADP cards and the cards checked for erro (Sinha-OEIS)
W77-01852

BASELINE STUDIES OF DEMERS RESOURCES OF THE EASTERN BERING S SHELF AND SLOPE,
National Marine Fisheries Service, Seattle, Wa Northwest Fisheries Center.
W. T. Pereyra, J. E. Reeves, and R. G. Bakkala.
In: Environmental Assessment of the Alas Continental Shelf. Principal Investigators' Repo for the Year Ending March 1976, Vol 7. F Plankton, Benthos, Littoral, p 219-242, April 19 6 fig, 3 tab.

Descriptors: *Resources developm *Environmental effects, *Baseline studies, *C regions, *Ecology, *Water pollution effects, pollution, *Continental Shelf, Alaska, *Deme fish, Population, Fishes, Crabs.
Identifiers: *Outer Continental Shelf, *Be Sea, *Catch statistics, *Commercial fisheries, exploration, Oil development, Petrol resources.

A three vessel synoptic survey of demersal resources was conducted in August-October 1975 in the eastern Bering Sea. A total of 654 stations were sampled. Catches or subsamples of catches occurring in standard one-half hour bottom tows were identified, weighed, enumerated and, for selected species, other biological data collected. Approximately 150,000 ADP cards were generated from the fall 1975 survey. These data are presently being analyzed. Summarization of pertinent biological literature on selected species of demersal fishes, crabs, and snails was undertaken. These summaries cover distribution, abundance, life history, population attributes, and exploitation patterns. Analysis of historical data on demersal fishes and crabs is underway. These data include catch statistics from commercial fisheries in the Bering Sea, U.S. and foreign research cruises, and other data sets. (Sinha-OEIS)
W77-01853

BEAUFORT SEA ESTUARINE FISHERY STUDY,
Alaska Dept. of Fish and Game, Fairbanks. Sport Fish Div.
T. N. Bendock.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7, Fish, Plankton, Benthos, Littoral, p 243-261, April 1976. 5 fig, 1 tab, 20 ref. 03-5-022-69.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Estuaries, *Anadromous fish, Continental Shelf, Alaska, Habitats, Fish.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, *Species composition, Salmonidae, Osmeridae, Gadidae, Cottidae, Pleuronectidae, Cyclopteridae, Oil exploration, Oil development, Petroleum resources.

Petroleum exploration and development is rapidly increasing throughout the nearshore areas of the Beaufort Sea. The objectives of this study were to determine the distribution and relative abundance of the various species of fish occupying the nearshore environs of the Beaufort Sea. Correlating important life history data with knowledge of habitat needs, it is hope that baseline information can be obtained to direct the activities of people and industry in the proposed lease area. It was found that species diversity within the study area is low. The anadromous species within the study area migrate and concentrate along the shallow, nearshore water of the mainland coast. The most frequently caught and wide ranging anadromous species are least cisco, Arctic cisco and Arctic char. Adult broad and humpback whitefish seldom range beyond the influence of the largest streams draining into the study area. And the presence of larval Arctic cod, capelin and fourhorn sculpins suggests that these species spawn in the coastal marine or estuarine waters of the study area. (Sinha-OEIS)
W77-01854

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
K. M. Feder, G. Mueller, and S. Jewett.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 263-453, April 1976. 5 fig, 14 tab, 67 ref, append. 03-5-022-65.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Benthos, *Invertebrates, *Biomass, *Distribution patterns, *Demersal fish, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Pacific cod, Gadus macrocephalus, Crabs, Chionoecetes bairdi, Species diversity, Diversity index, Oil exploration, Oil development, Petroleum resources.

Forty-two widely dispersed permanent stations were established in the northeastern Gulf of Alaska in conjunction with the physical, chemical, heavy metals and hydrocarbon programs. In general, high measures of evenness in the diversity indices show numerical codominance of many species (with low Simpson index and high Shannon and Brillouin indices) while low evenness measures imply marked dominance of a few species. Criteria established for Biologically Important Taxa (BIT) for the grab data have delineated 95 species. These species have been subjected to detailed analysis in an attempt to comprehend station species aggregations or communities. Preliminary analysis of the data indicates that the commercially important crab, Chionoecetes bairdi clearly dominates the invertebrate biomass. Further, stomach analysis of the Pacific cod Gadus macrocephalus on the Kodiak shelf area, reveals that C. bairdi is a dominant food item. Here we find a non-commercial species which has potential commercial importance, preying intensively on a species of great commercial significance. (Sinha-OEIS)
W77-01855

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE AND PRODUCTIVITY OF BENTHIC ORGANISMS OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 455-470, April 1976. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Benthos, *Bibliographies, Alaska, Continental shelf, Biology.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Oil exploration, Oil development, Petroleum resources.

The existing literature on the systematics, abundance and feeding biology on the Gulf of Alaska and Bering Sea marine organisms is summarized. Unpublished data and archived biological samples available for analysis were located. This information should provide a historical perspective of the abundance and distribution of benthic animals and establish the current state of knowledge on the biology of these organisms. With this historical perspective current OCS projects looking at the current distribution and biology of marine organisms can be interpreted in a larger time frame. (Sinha-OEIS)
W77-01856

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Smith, A. C. Paulson, and J. R. Rose.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 471-508, April 1976. 4 fig, 3 tab, 77 ref. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Benthos, *Demersal fishes, *Food habits, *Commercial fishing, Continental Shelf, Alaska, Bibliographies.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Oil development, Oil exploration, Feeding habits, Hippoglossoides, Hippoglossus, Lepidosetta, Sebastes, Glyptocephalus.

The ultimate goal is to construct a detailed picture of the food and feeding relationships of the fishes in the Gulf of Alaska and Bering Sea. This will include analyses of predator size vs. prey composition; bottom type, temperature and location vs. prey composition; prey composition in diets vs. prey abundance; prey composition vs. season. The rationale behind this study is to develop an ability to predict the impact of oil development activities on the fishes. This study, coupled with others designed to study acute and chronic toxic effects on the fish populations, will establish the predictive base necessary to make management decisions. (Sinha-OEIS)
W77-01857

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BERING SEA AND GULF OF ALASKA,
Alaska Univ., College.
J. E. Morrow.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 509-520, April 1976. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Forage fishes, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Faunal keys, Otoliths, Oil development, Oil exploration, Petroleum resources.

The objectives of this study are to prepare illustrated keys to skeletal remains and otoliths of forage fishes of the area. These will be used by investigators in other fields to determine the foods and trophic feeding levels of marine mammals, sea birds, and the larger demersal fishes. The implications with respect to OCS oil and gas development lie with these other studies rather than with this project. Skeletal material from 68 specimens of 35 species has been prepared and stored for future study. An additional 85 skeletons are in process. Otoliths have been obtained from 278 specimens representing 64 species in 16 families. Forty-six of these species were obtained from the 1975 trawling cruises, the remaining 18 from the University of Alaska Museum Fish Collection. On the basis of otoliths, working definitions of all 16 families have been prepared. A preliminary key to the families, genera and species is being prepared. (Sinha-OEIS)
W77-01858

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BEAUFORT SEA,
Alaska Univ., College.
J. E. Morrow.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 521-532, April 1976. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, Forage fish, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Beaufort Sea, Faunal keys, Otoliths, Oil development, Oil exploration, Petroleum resources.

A fairly large number of papers has been published in which the otoliths of major taxonomic groups

have been broadly characterized. However, no detailed work exists by which the otoliths of particular species may be recognized. This is especially true of the fishes of the far north, which have been virtually unstudied from any aspect The Beaufort Sea material has been combined with specimens from the Bering Sea and Gulf of Alaska to prepare a key to otoliths. On the basis of this material families have been defined, and a preliminary key to the otoliths is being prepared. It is suggested that copies of this key be sent to other investigators dealing with food habits of marine mammals, sea birds and demersal fishes for testing and comparison. (Sinha-OEIS)
W77-01859

LITERATURE SEARCH ON THE DENSITY AND DISTRIBUTION OF FISHES OF THE BEAUFORT SEA,
Alaska Univ., College.
J. E. Morrow.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 533-541, April 1976. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Bibliographies, *Fishes, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Beaufort Sea, Oil exploration, Oil development, Petroleum resources.

The sole objective is to prepare an annotated bibliography on the density and distribution of the fishes of the Beaufort Sea. This bibliography will provide a data base for future research in the aquatic environment of the area. The Beaufort Sea is virtually unknown as far as fauna is concerned. Neither qualitative nor quantitative aspects have been determined. Data exist as published or unpublished papers and reports, ranging from the narratives of early polar explorers to modern, highly technical reports on narrow aspects of the ecological relationships in small parts of the sea. By bringing all this information together in one place, we will contribute to the ability of future workers to predict, ameliorate and even avoid altogether the adverse effects of petroleum exploration and production on the environment. Almost 1,000 items have been searched, annotated and entered on file cards. (Sinha-OEIS)
W77-01860

ALASKA MARINE ICHTHYOPLANKTON KEY,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 543-578, April 1976. p 558-578. 03-5-022-67-TA9 No. 4.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Bibliographies, *Life history studies, *Fisheries, Continental Shelf, Alaska, Fish, Shellfish.
Identifiers: *Outer Continental Shelf, Ichthyoplankton key, Oil development, Oil exploration, Petroleum resources.

A preliminary key to the pelagic fish eggs of Alaskan waters has been constructed. The key is based on live material and covers 21 species of commercial or possible commercial value. Some species have been excluded because no information is available. A list has been prepared of commercially valuable Alaskan species, including 48 species of fish, 2 species of shrimps, 3 species of crabs, 3 species of clams, 1 species of scallop, and 1 species of abalone. A list of references for these species is included. A list has been prepared of Alaskan fishes with pelagic larvae. This list comprises 173 species from 37 families. A bibliography has been prepared covering life history information on 15 fish species of commercial value. There are approximately 100-130 references dealing with pelagic life history studies of Alaskan commercial species although many of these species are also found elsewhere. There is little available information concerning fishes in the Beaufort Sea. A bibliography of about 75 references to literature relating to ichthyoplankton and fisheries in Alaskan waters has been compiled. (Sinha-OEIS)
W77-01861

LITTORAL SURVEY OF THE BEAUFORT SEA,
Western Washington State Coll. Bellingham.
A. C. Broad.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 579-591, April 1976. 11 ref. 03-5-022-81.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Habitats, *Biota, *Aquatic animals, *Aquatic environment, Continental Shelf, Alaska, Arctic Sea, Crustaceans, Mollusks, Trophic levels, Amphipoda.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, Littoral survey, Epifauna, Polychaetes, Oil development, Oil exploration, Petroleum resources.

This study is a survey of the edge of the Beaufort Sea designed to characterize habitats and ecological relationships of the Alaskan Arctic Ocean coastline between the U.S.-Canadian border (Demarcation Point) and Point Barrow sufficient to provide an immediate estimate of risks incurred in OCS oil and gas exploration and development and to furnish a base for planning further research. Analysis of samples taken during the summer of 1975 includes sorting biological specimens from the substrate material retained on sieves or in nets, identification or tentative identification of specimens, counts by species, wet weight determinations, and preservation for storage. In general, the density of polychaete populations is greater in samples from depths of two meters or more and all so far sorted include at least several worms. The indication currently is that distribution of infauna in the very shallow water is uneven and may be related to the presence of peat (disintegrating tundra vegetation) in the substrate. The principal epifaunal animals of the shallow Beaufort Sea are crustaceans and our data so far are in agreement with this finding of other investigators. The principal infaunal animals of the shallow Beaufort Sea are mollusks and polychaetes. (Sinha-OEIS)
W77-01862

BEAUFORT SEA PLANKTON STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English, and R. A. Horner.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 593-671, April 1976. 9 fig, 10 tab, 5 ref, append. 03-5-022-67-TA2, No 4.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Phytoplankton, *Zooplankton, *Plankton, Continental Shelf, Alaska, Sea ice, Nitrates, Chlorophyll, Bibliographies.
Identifiers: *Outer Continental Shelf, *Oceanographic data, Beaufort Sea, Ice break up, Flora, Ichthyoplankton, Oil development, Oil exploration, Petroleum resources.

The two tasks of primary emphasis were to deter mine seasonal density distribution and environ mental requirements of principal species o phytoplankton, zooplankton, and ichthyoplankto and to determine seasonal indices of phytoplank ton production, including the sea ice flora. Th task of secondary emphasis will be to summariz the existing literature, unpublished data, an archived samples. Chaetoceros furcellatus i usually considered to be a spring diatom. It occu with spores in the Barrow area at the edge of th ice. The Thalassiosira species present are als spring forms. Many of the pennate diatoms, whil not identified to species, appear to be diatoms tha usually live in sea ice in spring. It appears that th phytoplankton community sampled in Septembe 1975 consisted primarily of species characteristi of the spring bloom that usually occurs about th time the ice breaks up. The average nitrate plu nitrite concentration was about twice that of 197 while ammonia was only slightly higher. Th could indicate that the phytoplankton bloom wa taking place during early September. The literatu review for Beaufort Sea zooplankton an phytoplankton is continuing. Approximately 6 references pertinent to Arctic zooplankton hav been obtained as well as approximately 125 Arct phytoplankton references. (Sinha-OEIS)
W77-01863

THE PHYSIOLOGICAL EFFECT OF ACUT AND CHRONIC EXPOSURE TO HYDROCA BONS OF PETROLEUM ON THE NEAR-SHOR FISHES OF THE BERING SEA,
Scripps Institution of Oceanography, La Jol Calif.
For primary bibliographic entry see Field 5C.
W77-01864

PHYSIOLOGICAL IMPACT OF OIL ON PI NIPEDS,
National Marine Fisheries Service, Seattle, Was Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01865

ACUTE AND CHRONIC TOXICITY, UPTA AND DEPURATION, AND SUBLETH METABOLIC RESPONSE OF ALASK MARINE ORGANISMS TO PETROLEU HYDROCARBONS,
National Marine Fisheries Service, Auke B Alaska. Auke Bay Lab.; and National Mar Fisheries Service, Seattle, Washington. Northw Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01866

RESPONSE OF THE CLAM, MACO BALTHICA (LINNAEUS), ESPOSED TO PRU HOE BAY CRUDE OIL AS UNMIXED O WATER-SOLUBLE FRACTION, AND SE MENT-ADSORBED FRACTION IN T LABORATORY,
National Marine Fisheries Services, Auke B Alaska. Auke Bay Lab.; and National Mar Fisheries Services, Seattle, Washingt Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01867

EFFECT OF PETROLEUM HYDROCARBO ON BREATHING AND COUGHING RAT AND HYDROCARBON UPTAKE-DEPURATI IN PINK SALMON FRY,
National Marine Fisheries Service, Auke B Alaska. Auke Bay Lab.; and National Mar Fisheries Service, Seattle, Wash. Northw Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01868

UBLETHAL EFFECTS AS REFLECTED BY IORPHOLOGICAL, CHEMICAL, HYSIOLOGICAL AND BEHAVIORAL IN-ICES,
ational Marine Fisheries Service, Seattle, Wash. orthwest Fisheries Center.
or primary bibliographic entry see Field 5C.
77-01869

ENTIFICATION OF MAJOR PROCESSES IN IOTRANSFORMATIONS OF PETROLEUM YDROCARBONS AND TRACE METALS,
ational Marine Fisheries Service, Seattle, Wash. orthwest Fisheries Center.
or primary bibliographic entry see Field 5C.
77-01870

SSESSMENT OF AVAILABLE LITERATURE N EFFECTS OF OIL POLLUTION ON BIOTA ARCTIC AND SUBARCTIC WATERS,
ational Marine Fisheries Service, Seattle, Wash. orthwest Fisheries Center.
or primary bibliographic entry see Field 5C.
77-01871

CUTE EFFECTS - PACIFIC HERRING ROE IN IE GULF OF ALASKA,
aska Univ., College. Inst. of Marine Science.
r primary bibliographic entry see Field 5C.
77-01872

CUTE AND CHRONIC TOXICITY OF SEA-ATER EXTRACTS OF ALASKAN CRUDE OIL) ZOEAE OF THE DUNGENESS CRAB, ANCER MAGISTER DANA,
egon State Univ., Newport. Marine Science nter.
r primary bibliographic entry see Field 5C.
7-01873

BLETHAL EFFECTS - EFFECTS ON SEA ASS,
ska Univ., College. Inst. of Marine Science.
primary bibliographic entry see Field 5C.
7-01874

E HYDROLOGY OF PREHISTORIC FARM-G SYSTEMS IN A CENTRAL ARIZONA OTONE,
uthern Illinois Univ., Carbondale.
primary bibliographic entry see Field 3F.
7-01891

TRAGEDY OF THE COMMONS IN THE HEL,
ssachusetts Inst. of Tech., Cambridge.
C. Picardi, and W. W. Seifert.
hnology Review, Vol. 78, No. 6., p 42-51, May, 6. 3 fig, 4 tab, 7 ref.

criptors: *Deserts, *Computer models, nge management, *Water shortage, *Arid ls, Ranges, Browse utilization, *Grazing, Rain, nfall, Precipitation(Atmospheric), Africa, ughts, Water utilization, Pastures, Soil ero-, Social aspects, Cattle, Conservation, Africa. ntifiers: *Desertification, *Commons concept, nel, *Overgrazing.

ording to the commons concept, when com-ly held resources are exploited according to vidual self interest, the resources will be exploited and destroyed by the same people benefit from them. The application of the mons concept in the Sahel area of Africa is ussed. Research was conducted and data col-d to create a computer simulation model relat-the interactions among the ecosystem, tock herds and the human population. The ose of the model was to test longterm policies he recovery and restoration of the Sahel areas so that AID organizations might work effectively to help the region's recovery and development. The utilization of water, the overgrazing of cattle and resulting desertification are discussed and conclusions presented. The model shows that herdsmen who graze cattle on the Sahel will continue to have the same priority of self interest, resulting in overgrazing of the range. For conservation of rangeland, a change in cultural priorities is necessary. (Jamail-Arizona)
W77-01908

WATER QUALITY ANALYSIS, UPPER MISSISSIPPI RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W77-01953

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, COLUMBIA RIVER.
Parametrix, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-01955

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, UPPER RIO GRANDE,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W77-01956

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HOUSATONIC RIVER,
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
For primary bibliographic entry see Field 5G.
W77-01957

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ESCAMBIA RIVER AND BAY,
Atlantis Scientific, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W77-01961

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GUADALUPE-SAN ANTONIO RIVER BASIN,
Water Resource Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W77-01962

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ST. JOHN RIVER ESTUARY (FLORIDA),
Atlantis Scientific, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W77-01964

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GULF OF ALASKA.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01966

WATER QUALITY ANALYSIS, THE POTOMAC RIVER.
GKY and Associates, Alexandria, Va.
For primary bibliographic entry see Field 5G.
W77-01968

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, S. CALIFORNIA BIGHT.
Tetra Tech, Inc., Pasadena, California.
For primary bibliographic entry see Field 5G.
W77-01969

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HAWAII.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01970

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, PUERTO RICO.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01971

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, SOUTH PLATTE.
Tetra-Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01972

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, SUSQUEHANNA RIVER.
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
For primary bibliographic entry see Field 5G.
W77-01973

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, SANTEE RIVER BASIN.
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W77-01976

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ST. JOHN RIVER (MAINE).
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-01977

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, DELAWARE RIVER BASIN, (PARTS 1, 2, AND 3).
Betz Environmental Engineers, Inc., Plymouth Meeting, Pa.
For primary bibliographic entry see Field 5G.
W77-01978

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, GREAT LAKES-LAKE ERIE, (VOLUMES 1, 2, AND 3).
Dalton-Dalton-Little-Newport, Inc., Cleveland, Ohio.
For primary bibliographic entry see Field 5G.
W77-01979

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, CHATTAHOOCHEE-FLINT-APALACHICOLA, (PARTS 1 AND 2).
Hammer, Siler, George Associates, Atlanta, Ga.
For primary bibliographic entry see Field 5G.
W77-01980

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, OHIO RIVER BASIN, (VOLUMES 1 AND 2).
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-01981

FUTURE ENVIRONMENTAL NEEDS AND COSTS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

S. F. Singer.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 7-31 and 279-282. 3 fig., 1 tab., 3 ref. NO1-HD-22052.

Descriptors: *Pollution abatement, *Welfare(Economics), *Economic impact, *Costs, Economic efficiency, Cost-benefit analysis, Equitable apportionment, Gross National Product, Marginal costs, Marginal benefits, Cost allocation.
Identifiers: Environmental quality costs, Demography.

The question of how to strike a balance between spending funds for a clean environment and spending funds for other things that contribute to the welfare of people is approached. Although theoretical approaches such as benefit-cost analysis are available for such evaluations, often the costs can not be measured very well, and the benefits are difficult to define. Also dealt with are the questions of achieving the chosen level of environmental quality in the most efficient way, and of maintaining equity in the system as each gradient of the clean environment is achieved. The most important determinant for environmental quality expenditures is the level of environmental quality desired. Ideally this would be set where the marginal benefits and marginal costs of investment are equal, however a fluctuation around the ideal is more realistic given political considerations. Costs of pollution should always be added to the cost of manufacture if the polluter is an industrialist, resulting in the passing of the cost on to the purchaser of the product. In order to better understand the effects of growth specifically on environmental quality and generally on societal welfare, a single index incorporating population, resources, environment, and GNP is developed. A model of pollution control costs is appended. (Becker-Wisconsin)
W77-02044

EFFECTS OF POLLUTION ON HUMAN HEALTH,
Environmental Protection Agency, Chapel Hill, N.C. Clinical Studies Branch.
N. Rummo.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 33-73. 21 tab.

Descriptors: *Air pollution effects, *Public health, *Pollution abatement, *Standards, Pollutants, Costs, Control, Estimating, Risks, Safety, Measurement, Approximation method.

The Clean Air Act of 1970, which promulgated standards for six air pollutants (sulphur dioxide, carbon monoxide, oxident levels, oxides of nitrogen, particulates, and hydrocarbons) assumes that there exists a morbidity threshold for each pollutant and for every adverse health effect. This is questionable. The Clean Air Act requires that standards be set to protect the public health and that these standards contain an adequate margin of safety. Adverse effects include both the aggravation of existing diseases and an increased frequency of health disorders. There are difficulties determining what changes in body functions are responsive to a particular pollutant. Also difficult is the determination of harm from pollutants to groups that are particularly susceptible, such as persons with certain diseases, infants and unborn fetuses and embryos. Air pollutants, either separately or in combination with other pollutants, may increase the risk in the general population for the development of certain disorders. Although the severity of the effects of individual pollutants is understood, the scientific information on which the air quality standards is based has major gaps. Most adverse health effects are best evaluated by blending the complementary research approaches of epidemiology, clinical research, and animal toxicology. (Becker-Wisconsin)
W77-02045

ENVIRONMENTAL POLLUTION CONTROL AND HEALTH BENEFITS,
Washington Environmental Research Center, D. C. Economic Analysis Branch.
T. E. Waddell.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 75-91. 6 ref.

Descriptors: *Benefits, *Public health, *Morbidity, *Mortality, *Air pollution effects, Economic efficiency, Equity, Costs.

To economists, problems resulting from environmental pollution are due to the inability of the market place to allocate resources. For informed and economically efficient and equitable management decisions to be made (instead of relying on the marketplace) adequate information must be provided for the decision-maker, including (1) cost of control, (2) benefits of control, (3) who pays, and (4) who benefits. Of the total calculus of benefits from the abatement of air pollution, certainly in the short run, those to human health rank in the highest priority, but are not easily measured. To economists, the conceptually correct notion of health benefits is the willingness to pay for improved health: but since it is difficult to elicit such measures directly, proxies are used. Several methods of approximating the benefits to human health from air pollution abatement are included. The loss of output and cost of medical care approach is discussed in terms of both morbidity and mortality. The questions of valuing time empirically is also approached. The best estimate of cost savings to human health in 1970 for both mortality and morbidity is estimated between $1.6 billion to $7.6 billion for suspended particulates, suspended sulfates and sulfur oxides reduced to primary standards. (Becker-Wisconsin)
W77-02046

ECONOMICS OF ENVIRONMENTAL CONTROL POLICIES,
Atomic Energy Commission, Washington, D. C. Bureau of Licensing.
J. F. O'Leary.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 95-115.

Descriptors: *Decision making, *Cost-benefit analysis, *Nuclear powerplants, *Standards, Pollution abatement, Radioactivity, Economic impact, Sites, Risks, Fisheries, Fossil fuels, Measurement, Attitudes.
Identifiers: *Risk-benefit tradeoffs.

To a degree, environmental standards are a product of health and economic concerns, but to a substantial degree they are also a product of feelings for the fitness of things--things that are really not quantifiable. Informed judgment, rather than strictly applied analytical tools, have to be relied on as the arbiter of how to go about handling environmental problems; however, it is important to develop the physical and economic measurements so that analytical tools can be objectively applied in the future. The role of the Atomic Energy Commission in the advancement of the art of benefit-cost analysis is illustrated. The AEC adopted the as-low-as-possible (ALAP) approach towards radiological emissions, without being explicit as to the economic parameters of the practicable, and through the application of the ALAP doctrine, brought the controversy about nuclear plant-sitings under control. A question and answer period following the paper presentation initiated discussion of topics varying from specific problems to international emissions standards and methodology. Underground nuclear facilities ing, the value of fisheries vs. nuclear facilit and fossil fuel energy versus nuclear energy w some of the topics. Cost-benefit analysis discussed in terms of being the best availa technique, but still lacking precision. (Beck Wisconsin)
W77-02047

INTRODUCTORY REMARKS ON ENVIRO MENTAL CONTROL STRATEGIES,
Mitre Corp., McLean, Va.
R. S. Greeley.
In: Symposium proceedings 'Economics o Clean Environment', January 14-16, 1974, M Corporation, McLean, Virginia (Report M-74 July 1974), p. 117-128.

Descriptors: *Pollution abatement, *Co *Economic impact, *Standards, Water pollu control, Air pollution, Economic efficiency, E gy, Sulfur, Waste treatment, Domestic wastes, dustrial wastes, Toxins, Mining, Equity, S governments.
Identifiers: *Selective pollution control.

The United States could do much better in the of environmental control strategies from a cos fective standpoint by developing and adop regulations at a local level. The total anti-pollu cost over the next decade is estimated by Council on Environmental Quality to be $275 lion, some of which are unnecessary costs. problem areas in environmental control which present legislation into account and give cos fective long run results are discussed: (1) stati ry sources of air pollution, (2) mobile source air pollution, (3) water pollution, (4) toxic stances, and (5) resource extraction. shortages of low sulfur fossil fuels and increas waste discharges into water, state regulations control of both air and water pollution were d up without regard to the relative contributio polluters. Equity and uniformity were emphas at the cost of economic inefficiency. In the substances and resource extraction areas bot economic considerations behind legislation the long term ecological and health effects ne be examined more closely. New concepts, bot stitutional and cultural, are needed as goals fo vironmental control strategies. A better cost-e tive point can be reached despite increased ministrative costs and equity problems. (Be Wisconsin)
W77-02048

ENVIRONMENTALIST VIEW OF 'N DEGRADATION,' 'BEST PRACTICA TECHNOLOGY' AND 'BEST AVAILA TECHNOLOGY',
Sierra Club, Washington, D. C.
L. I. Moss.
In: Symposium proceedings 'Economics Clean Environment', January 14-16, 1974, Corporation, McLean, Virginia (Report M-7 July 1974), p. 129-168. 3 tab., 11 ref.

Descriptors: *Air pollution, *Energy, *Clea Act, *Pollution abatement, Technology, El power production, Pricing.
Identifiers: *Sierra Club, *Air quality stand Best practicable technology, Best ava technology, Alternate energy sources, E pricing.

A great deal of reform is needed in terms economies and pricing of energy. By not sub ing energy intensive activities, capital is which can then be allocated to investments higher intrinsic rates of return. In the gas and tricity industries, all users ought to pay at which is enough to cover the cost of devel new or replacement supplies. With regard quality standards, the Sierra Club law suit a the Administrator of EPA emphasized the lo inadequacies of the Clean Air Act of 1970. A

point plan proposed to prevent significant deterioration of air quality includes national limits on allowable increases in ambient concentrations and an open process for public comments on applications for permits. On the issues of best practicable and best available technology, the question of whether to substitute a new technology rather than to rescue the existing technology is discussed. Economic incentives do not presently exist for polluters to rapidly develop and implement technology. Also included are a question and answer session during which alternate energy sources were discussed, and the Sierra Club testimony given at EPA hearings (August, 1973) on 'Significant Deterioration.' (Becker-Wisconsin)
W77-02049

INDUSTRIALIST VIEW,
Chamber of Commerce of the United States, Washington, D. C.
J. Coffey.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 169-186.

Descriptors: *Pollution abatement, *Industrial production, *Economic impact, *Social impact, Clean Air Act, Federal Water Pollution Control Act, Land use, Standards, Cities, Legislation, Government supports, Pollution taxes(Charges).
Identifiers: *Economic growth.

Pollution abatement legislation is affecting the future of economic growth in the United States. The environmental policy emphasizes the impact of certain human activities on portions of the physical environment and almost ignores any social and economic impact. There are three major elements, the Clean Air Act, the Water Pollution Control Act, and proposed Land Use legislation, that contribute to this policy. Social and economic impacts in the implementation of primary and secondary air quality standards are discussed. The non-degradation policy of EPA will tend to concentrate population and industry in areas already under substantial environmental pressure. The location of new facilities of any kind is a difficult problem given constraint by the Clean Air and the Federal Water Pollution Control Acts. Land use legislation and its long term ramifications is related to industrial planning, and private property rights. The concept of non-degradation is developed as it relates to the full quality of life as opposed to just one aspect of the physical environment. It is suggested that laws and regulations will be more workable only after the public becomes aware of how costly and in some respects how redundant, in terms of health and the physical environment, they are. (Becker-Wisconsin)
W77-02050

GOVERNMENT VIEW,
D. D. Dominick.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 187-221.

Descriptors: *Decision making, *Pollution abatement, *Air pollution, *Standards, Clean Air Act, Social impact, Legislation, Transportation, Industrial production, Economic impact, Land use.
Identifiers: *Ambient air quality, EPA, Sierra Club, Clean airsheds, Zero pollution.

The EPA has taken a position to take into account unintended and undesireable consequences of Congressional legislation in the regulations it has to enforce. The case of Sierra Club vs. Ruckelshaus is used to illustrate principles and problems facing decision-makers in the field of environmental regulation. In response to the 1970 Clean Air Act many institutions, public and private, interacted in a process to determine the public interest' before the matter was remanded to EPA with the prevention of significant air quality deterioration as the goal. The logic used to determine the administrative definition of 'significant air quality deterioration' is discussed. Explicit arguments used by EPA for their reluctance to implement a strict nondegradation policy in air quality included: (1) the courts did not define the term 'significant deterioration', (2) nationwide air quality is improving considerably, and (3) the measures necessary to prevent all deterioration would bring growth and development to a virtual standstill. Speculation on implied and unstated reasons for EPA policy-makers' reluctance for a strict policy included such ideas as: (1) it could be tantamount to prohibiting new growth or new activities anywhere, and (2) it could put EPA's future as a social force on trial. (Becker-Wisconsin).
W77-02051

PANEL 'A' - AUTOMOTIVE EMISSIONS,
L. A. Goldmuntz.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 225-230 and 283-312. 1 fig, 3 tab.

Descriptors: *Air pollution, *Pollution abatement, *Standards, *Economic efficiency, Conferences, Clean Air Act, Safety, Oxides, Catalysts, Cities, Rural areas, Pollutants, Suspended solids, Sulfur compounds.
Identifiers: *Automotive emissions, Carbon monoxide, Nitrous oxides, Hydrocarbons, Sulfur dioxide, Particulates.

The automotive emissions regulations were discussed to determine the cost effectiveness of the strategy as related to standards for carbon monoxide, nitrous oxides, and oxidants; the safety factors where health related effects are first detected; and the allowable standards to meet ambient levels taking into account other source contributions. Also discussed were the automotive technology applicable to various emission standards, the capital costs and fuel costs associated with each technology, the probability of an octane war, and the improved cost effectiveness that would derive from granting the EPA flexibility to set the time for compliance as a function of a given region's problem, topography and population density. There was substantial disagreement between EPA and industry on how automotive emissions should be related to ambient standards although concurrence was reached that carbon monoxide levels could be satisfied by 1980 utilizing a standard of 20 g/mile. Levels (per mile) of 1-1.5 for hydrocarbons, 20-25 for carbon monoxide, 3-3.5 for nitrous oxides can be met by spark timing, mixture adjustments, manifold reactors or leaded fuel and high compression engines at costs less than $100 to the consumer. Certain stricter standards can be met by an exhaust catalyst at a $250 cost. An emission standard for California, utilizing the catalyst, and one for the remainder of the country, using engine fixes would be acceptable to the industry. (Auen-Wisconsin)
W77-02052

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION,
Interstate Commission on the Potomac River Basin, Bethesda, Md.
For primary bibliographic entry see Field 5G.
W77-02053

PANEL 'C' - TOXIC SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
G. E. Schweitzer.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 231-241 and 313-330.

Descriptors: *Economic impact, *Chemicals, *Regulation, *Public health, *Cost-benefit analysis, Pollution abatement, Welfare(Economics), Decision making, Toxicity, Social impact, Risks, Pollutants.
Identifiers: *Risk-benefit trade-offs.

This panel's discussion considered the complexities involved in limiting or prohibiting usage of chemicals of defined deleterious effects or those posing synergistic or unknown health hazards and the problems inherent inherent in the evaluation of the risk vs. economic benefits in prescribing standards. Among the examples of risk-benefit trade-offs cited are the bans on DES as a cattle feed additive, on DDT in relation to the tussock moth infestations, on leaded gasoline, cadmium, PCBs, cyanide, asbestos, and beryllium and the consequent impact on manufacturing processes and long range economic effects. Questions were posed regarding the identification of a threshold effect on health, if assumptions can be made whether substances have or have not a threshold, and what decisions are involved when thresholds are below detection levels; and the aspects of delayed, irreversible and reversible effects in relation to risk-benefit evaluation. Other areas addressed were: how much cost should be incurred from regulation; how much effort should be expended in determining what commercial substances are toxic; which should be tested in view that substances change with the introduction of new products; and how to relate the expense of tests to avoid restriction of new products and stifling industrial research. The presumption is that risk-benefit approaches will be acceptable within a decade depending on their socio-economic utility. (Auen-Wisconsin)
W77-02054

PANEL 'D' - POWER PLANT AND INDUSTRIAL EMISSIONS AND EFFLUENTS,
Mitre Corp., McLean, Va.
R. S. Greeley.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 257-268 and 343-360.

Descriptors: *Pollution abatement, *Standards, *Powerplants, *Industries, Air pollution, Water pollution, Social aspects, Economic impact, Cost-benefit analysis, Capital investment, Technology, Regional analysis, Alternative planning, Public health, Tennessee Valley Authority, Economic efficiency, Energy, Water quality standards.
Identifiers: Effluent standards, Emission standards, Emission standards, Ambient standards.

The discussion centered on health effects of pollutants, control technology, impact of controls on energy and materials consumption, and cost-benefit and cost effective approaches. Cost-benefit analysis of pollution standards should embrace the societal risk even though comprehensive data on health effects of pollutants may be unavailable and that no satisfactory method of accounting for these has been devised. It was emphasized that those population segments which bear the costs and which receive the benefits should be identified and incorporated in cost-benefit analyses. Viewpoints were expressed on resolution of pollution control problems based on a fundamental and totally integrated approach, a genuine corporate commitment, a federal R and D program, a need for defining the elements of cost and benefits in a total sense, and the cost effectiveness in terms of risk reduction afforded and a more precise definition of that concept. A TVA representative described the strategy employed by them in emission controls, particularly in relation to sulfur oxides, followed by a discussion concerning the global dispersion of sulfur oxides. It was agreed that the current procedures of standard-setting fail to consider both the characteristics and location of the emitter, and that these factors are critical in effective control measures. The question

of 'effluent/emission guidelines' and 'air/water quality standards' was discussed as exemplified by the TVA control methods. (Auen-Wisconsin)
W77-02055

PANEL 'E' - RESOURCE EXTRACTION,
Geological Survey, Reston, Va. National Center.
H. Risser.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 269-275 and 361-381.

Descriptors: *Mining, *Environmental effects, *Environmental control, *Economic justification, Strip mines, Oil industry, Natural gas, Continental Shelf, Acid mine water, Oil shales, Legislation, Land reclamation, Pollution taxes(Charges), Offshore platforms, Oil spills, Road construction, Land subsidence, Earthquakes, Water demand, Colorado River.
Identifiers: Geothermal energy.

The discussion centered on the environmental impact and economic efficiency of surface and underground coal mining, offshore oil and gas operations, geothermal power, and oil shale development. Land reclamation costs induced by surface mining depend on the site and the extent of reclamation required. The economic impact would depend on whether the costs can be passed on to the consumer. Outer Continental Shelf operations would involve construction of offshore facilities and minor and major oil spills. Clean up costs of spills can run into millions of dollars and economic losses suffered by tourism and fishermen because of oil polluted beaches and contaminated fish can be substantial. Underground coal mining has a lesser initial environmental impact but it generates surface subsidence and acid water discharges for many years. Treatment costs vary and precautionary measures can be taken. Geothermal power extraction has the potential for disrupting closed areas by operational facilities, land subsidence, stream pollution, increased microseismic activity and well blowouts. Geothermal dry steam can generate electricity more economically than conventional fuels but it would provide no more than 2% of the total U.S. energy required in the year 2000. Oil shale development would entail huge quantities of waste and require large quantities of water both for processing and waste disposal. (Auen-Wisconsin)
W77-02056

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION: NON-POINT SOURCES AND COST EFFECTIVENESS,
Enviro-Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5G.
W77-02057

THE EFFECTS OF WATER POLLUTION FROM NON-POINT SOURCES AS IT RELATES TO THE HEALTH OF MAN,
Health Science Associates, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5G.
W77-02058

CONTROL OF AMBIENT SO2 CONCENTRATIONS BY NONCONTINUOUS EMISSION LIMITATION LARGE COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Muscle Shoals, Ala. Air Quality Branch.
T. L. Monthomery, J. M. Leavitt, T. L. Crawford, and F. E. Gartrell.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p 427-454. 7 fig, 3 tab, 5 ref.

Descriptors: *Powerplants, *Air pollution, *Pollution abatement, *Weather patterns, Tennessee Valley Authority, Dispersion, Kentucky, Alabama, Tennessee.
Identifiers: *Sulfur dioxide.

The Tennessee Valley Authority's experience in reducing emissions of sulfur dioxide from its fossil fueled power plants demonstrates the practicality of reducing the generating loads during adverse meteorological conditions when emissions would exceed ambient standards. The program included investigations into the plume dispersions and evolution of mathematical models for estimating maximum ground-level concentrations of sulfur dioxide and the location of associated impact areas at each of the power plants. Emission limitations are achieved by plant generating load reductions during adverse plume dispersion periods as identified by on-site meteorological measurements. Since the beginning of the sulfur dioxide emission limitation program in September 1969 and continuing for 39 months, there have been 106 days when the meteorological conditions would have required some emission limitation if the plants had been operating at or near full capacity. However, due to unit outage or below full-load operation, there were only 41 days when the generating load had to be reduced. The magnitude of the load reductions ranged from 26 to 960 MW with an average of 454 MW. The average load reductions average 3.6 hours. The program has proved to be very effective in meeting state ambient air quality standards. (Auen-Wisconsin)
W77-02059

THE SAGA OF THE ENVIRONMENTAL STANDARD,
Mitre Corp., McLean, Va.
R. P. Ouellette.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p 455-460.

Descriptors: *Decision making, *Air pollution, *Standards, Pollution abatement.
Identifiers: *Emission standards, *Ambient standards.

The choice of threshold air emission standards in relation to health based on emplitude stresses but ignoring the rate-dependent, rate-sensitive, rate limited, symbiotic and other uncontrollable covariants is questioned. In setting standards for the small quantities of 'hazardous substances' it is suggested that because many of these compounds are of similar chemical classes and originate from a limited number of sources in defined geographical areas, with similar behavior and pathways in the environment, combined standards could be set for those pollutants. While ambient standards are more acceptable than emission standards based on 'best available technology' they limit the industrial flexibility in control and as goals are not enforceable; therefore both ambient and emission standards may be needed. Another problem to be addressed is the priorities given to setting standards--which compounds should have a standard and in what order they should be set, given time, monies, and knowledge constraints. Also should dispersive quantity alone be a guide or should stability of the compound, movement in the environment, hazards, and potential for bioconcentration be taken into consideration. While standards have been viewed in the context of risk, cost and benefit tradeoff, a more efficient standard would be that which is set at a point where the marginal cost of control is equal to the marginal benefit. (Auen-Wisconsin)
W77-02060

NATIONAL EFFLUENT STANDARDS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-02061

SUBSTANTIVE RIGHTS UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT,
Syracuse Univ., N.Y. Dept. of Law and Public Policy.
For primary bibliographic entry see Field 6E.
W77-02067

7. RESOURCES DATA

7A. Network Design

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va.
M. E. Moss.
Hydrological Sciences--Bulletin, Vol. 21, No. 1, p. 113-127, March 1976. 2 fig, 3 tab, 11 ref. (Paper from Symposium and Workshops--Bratislava September 1975: Application of Mathematical Models in Hydrology and Water Resource Systems).

Descriptors: *Surface waters, *Hydrologic data, *Networks, *Design, Regression analysis, Simulation analysis, Optimization, Streamflow, *Methodology, Economics, Equations, Mathematical models, Systems analysis, Regional analysis.
Identifiers: Gauging stations, Cost minimization.

The concept of equivalent years of record, a measure of parameter accuracy, in conjunction with regression analysis simulation leads to a methodology for specifying sets of numbers of gauging stations and lengths of record required to attain a prespecified level of regional streamflow parameter accuracy. This methodology can be used in network design to identify the number of stations and length of record that is the least cost network that meets the accuracy criteria. The methodology also indicates situations in which the criteria cannot be met without improving the underlying regionalization model. (Bell-Cornell)
W77-01885

7B. Data Acquisition

LONG-RANGE ECHO SOUNDING WITH A CHIRP SOURCE,
Woods Hole Oceanographic Institution, Mass. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W77-01614

SOIL WATER CONTENT AND EVAPORATION DETERMINED BY THERMAL PARAMETER OBTAINED FROM GROUND-BASED AND REMOTE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W77-01618

ON POLARIZATION FEATURES OF RADIO SIGNALS SCATTERED FROM THE SEA SURFACE AT SMALL GRAZING ANGLES,
Akademiya Nauk URSR, Kharkov. Inst. of Radio Physics and Electronics.
For primary bibliographic entry see Field 2L.
W77-01620

FIELD MAPPING SOIL CONDUCTIVITY TO DELINEATE DRYLAND SALINE SEEPS WITH FOUR-ELECTRODE TECHNIQUE,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 2G.
W77-01622

GRAVITATIONAL CIRCULATION IN LONG ISLAND SOUND,
State Univ. of New York at Stony Brook, Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W77-01634

BOUNDARY-LAYER TRAJECTORY ESTIMATES COMPARED WITH CONSTANT-VOLUME BALLOON TRAJECTORIES IN THE GREAT PLAINS,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
For primary bibliographic entry see Field 2B.
W77-01701

SUMMERTIME RADAR ECHO DISTRIBUTIONS OF MOIST CONVECTION OVER SOUTHERN NEVADA AND ADJACENT AREAS FOR 1971 AND 1972,
National Oceanic and Atmospheric Administration, Las Vegas, Nev. Air Resources Lab.
For primary bibliographic entry see Field 2B.
W77-01702

AN AID TO AGRICULTURAL DEW FORECASTING,
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W77-01704

METHOD FOR MEASURING VELOCITY AND DIRECTION OF CURRENTS IN A BODY OF WATER,
Office of the Secretary (Navy), Washington, D. C. (Assignee).
T. S. Richardson.
U. S. Patent No. 3,972,231, 8 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 65, August 3, 1976.

Descriptors: *Patents, *Water circulation, *Ocean circulation, *Currents(Water), *Velocity, Movement, Instrumentation, *Measurement, Dye dispersion, Marking techniques.
Identifiers: Direction.

A method for measuring velocity and direction of currents in bodies of water, such as an ocean, and more particularly to a method for making and recording a number of readings of current velocity and direction at various depths is disclosed. A first vehicle travels through water leaving a trail of dye and after a time delay, a second vehicle travels the same path as the first vehicle and measures the distance from the second vehicle to the dye path. The first and second vehicles are connected together, weighted, and dropped to the ocean bottom. Upon contact with the bottom, the first vehicle is released and rises to the surface under its own buoyancy. During ascent, a concentrated trail of fluorescein dye is released. After preselected time delay at the bottom, the second vehicle is released and rises to the surface. The second vehicle is provided with a recording optical rangefinder which measures the distance and direction to the trail of fluorescein dye left by the first vehicle. Such recording of the direction and distance to the dye trail gives a current vector at that depth and an essentially continuous profile of current speed and direction with depth is achieved. In another embodiment of the invention, a weighted vehicle is released from the surface and free-falls to the ocean bottom and after a specific delay a second vehicle is released over substantially the same path as the first vehicle. (Sinha-OEIS)
W77-01713

LOW LEVEL SNOW PRECIPITATION GAUGE,
Idaho Industrial Instruments, Inc., Boise, (Assignee).
For primary bibliographic entry see Field 2C.
W77-01744

WATER WHEEL ALL SEASON RAIN GAGE,
J. B. Davis.
U.S. Patent No. 3,978,723, 6 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 77, September 7, 1976.

Descriptors: *Patents, *Rain, *Rain water, *Rain gages, Rainfall, *Instrumentation, Precipitation(Atmospheric), Water wheels, *Measurement.

An improved rain gage is described which uses a small precision made water wheel that moves constantly during rainfall in a variation of movement of light to heavy rainfall. The shaft of the water wheel drives three dials of 0 to 1, 1 to 10, 10 to 100 inches, using a knocker system without resetting the dials. All moving parts are water lubricated the moment of the first moisture to fall. The gage has a trough having an inlet for collecting rain and an outlet for discharging it. (Sinha-OEIS)
W77-01753

MONITORING GROUNDWATER QUALITY: MONITORING METHODOLOGY,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01775

NATIONAL EUTROPHICATION SURVEY METHODS 1973-1976.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
For primary bibliographic entry see Field 5A.
W77-01787

THE HYDROLOGY OF PREHISTORIC FARMING SYSTEMS IN A CENTRAL ARIZONA ECOTONE,
Southern Illinois Univ., Carbondale.
For primary bibliographic entry see Field 3F.
W77-01891

USE OF CONSTANT LEVEL JAIN EVAPORIMETER IN SCHEDULING IRRIGATION,
Udaipur Univ. (India). Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W77-01907

POTENTIAL USE OF SATELLITE IR DATA FOR ICE THICKNESS MAPPING,
Development and Resources Transportation Co., Silver Spring, Md.
For primary bibliographic entry see Field 2C.
W77-01913

SOIL MOISTURE SURVEY EXPERIMENT AT PHOENIX, ARIZONA,
EG and G, Inc., Las Vegas, Nev. Las Vegas Area Operations.
For primary bibliographic entry see Field 2G.
W77-01914

ON THE POSSIBLE DETECTION OF TSUNAMIS BY A MONITORING OF THE IONOSPHERE,
Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
For primary bibliographic entry see Field 2L.
W77-01918

CALCIUM CARBONATE DISTRIBUTION IN THE SURFACE SEDIMENTS OF THE INDIAN OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W77-01919

WAVE PATTERNS ACROSS THE NORTH ATLANTIC ON SEPTEMBER 28, 1974, FROM AIRBORNE RADAR IMAGERY,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 2L.
W77-01921

RADAR IMAGING OF OCEAN SURFACE PATTERNS,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 2L.
W77-01932

FLASH FLOODS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2E.
W77-01933

HYDRAULIC PERFORMANCE OF FLUMES FOR MEASUREMENT OF SEDIMENT-LADEN FLASH FLOODS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W77-01935

FIELD MONITORING EQUIPMENT FOR HYDROLOGICAL STUDIES IN A SMALL CATCHMENT,
Bristol Univ. (England). Dept. of Civil Engineering.
T. L. Shaw, R. J. Marshall, H. S. Wheater, and N. P. Markovits.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 29-33, 1974. 2 fig, 3 ref.

Descriptors: *Small watersheds, *Monitoring, *Hydrologic data, *Instrumentation, Equipment, Networks, Rain gages, Rainfall, Measurement, Soil moisture, Streamflow, On-site investigations, Data processing.

This paper reviewed the design and operation of a network of field instruments that continuously measure rainfall and streamflow. The instruments collect information and process it for storage on magnetic tape. Details were given of all the stages of data collection and the precautions that must be taken. (See also W77-01933) (Humphreys-ISWS)
W77-01936

DISASTERS CAUSED BY FLASH FLOODS,
National Research Center for Disaster Prevention, Tokyo (Japan).
For primary bibliographic entry see Field 2E.
W77-01937

OPERATIONAL ARRANGEMENT OF RAINGAUGE STATIONS IN FORECASTING FLASH FLOODS,
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 4A.
W77-01938

WARNING SYSTEM FOR SEVERE FLOODS,
Water Survey of Canada, Calgary (Alberta).
W. Nemanishen.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 81-86, 1974. 4 fig.

Descriptors: *Warning systems, *Flash floods, *Canada, *Flood forecasting, Floods, Remote sensing, River forecasting, Hydrology, Networks.

Two requirements for combatting severe flash floods are preparation and alertness. Suggested

advance preparations include pre-flood field and office organization. Pre-flood field preparations may require several years to complete if they include: (1) cross sections drawn from all strategic highway and railway bridges, (2) some current-meter measurement made at these sites to define a rough elevation-discharge relationship, (3) permanent benchmarks established at each bridge and the elevation of several prominent bridge members (e.g., guard rails, tracks) determined, (4) several small index basins instrumented to monitor runoff, and (5) reporting and/or observer network established. Office preparations include: (1) the drawing of hydrometeorological data flow charts, (2) compiling estimates for maximum probable floods, and (3) writing flood forecasting handbooks. Alertness requires an early warning storm alert system which incorporates quantitative precipitation forecasts and storm tracking. Useful input to this sytem includes satellite photographs, forestry lookout towers, and ham radio operator reports. (See also W77-01933) (Humphreys-ISWS)
W77-01939

FLOOD MEASUREMENTS IN AN URBAN ENVIRONMENT: A DATA USER'S VIEWPOINT,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-01940

THE OPERATIONAL USE OF DIGITAL RADAR DATA FOR FLASH FLOOD MONITORING,
National Weather Service, Silver Spring, Md. Office of Hydrology.
D. R. Greene, and R. A. Clark.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 100-105, 1974. 3 fig, 6 ref.

Descriptors: *Flash floods, *Monitoring, *Precipitation(Atmospheric), *Remote sensing, Radar, Surveys, Rainfall disposition, Rainfall intensity, Measurement, Data processing, Computers, Digital computers, Rates, Distribution patterns, Precipitation intensity.

Observation of rainfall on a fine temporal and spatial scale and prediction in the short period (0-2 h) are prime ingredients of a flash flood monitoring system. The system should include information on the intensity, speed and direction of movement, configuration, and orientation of the storm. The instantaneous remote sensing capability of radar allows it to detect accurately, with good resolution, storm rainfall patterns and the spatial discontinuities and temporal fluctuations associated with these patterns. Radar coupled with a dedicated digital computer provides the means in real time to observe automatically and accumulate rainfall amounts. Through extrapolation, future rainfall totals may be estimated, thereby giving alert to potential flood producing conditions. One severe flash flood-producing storm was analyzed objectively through the use of the computer software package under development for flash flood monitoring. The results of the study showed that the real time, automated, operational use of digital radar data holds real promise for the detection, identification, and prognosis of potentially severe flash flood-producing storms. (See also W77-01933) (Humphreys-ISWS)
W77-01941

SYSTEMS FOR PREPARING TIMELY FLASH FLOOD WARNINGS,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W77-01942

THE USE OF REMOTE SENSING SYSTEMS IN MONITORING DESERT FLOODS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
A. Porath, and A. P. Schick.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 133-139, 1974. 3 fig, 15 ref.

Descriptors: *Flash floods, *Warning systems, *Monitoring, *Deserts, *Arid lands, Floods, Instrumentation, Small watersheds, Watersheds(Basins), Flood waves, Flood protection, *Remote sensing.
Identifiers: *Israel.

The remote sensing system of the Nahal Yael Research Watershed in Southern Israel was described. The synchronized recording system which converges to a location several kilometers distant is utilized to provide an alarm system which consists of an automatic dialing apparatus coupled to the countrywide telephone system. The center, when dialed, also responds in such a way that the caller can evaluate the flood potential of the catchment at that moment. The general and technical aspects of another flood warning system, based on signals fed by the flood wave itself, were discussed and evaluated in the light of desert conditions. A practical development of that system -- a road traffic light warning system -- was described. (See also W77-01933) (Humphreys-ISWS)
W77-01944

A DRAWDOWN PREDICTION MODEL BASED ON REGRESSION ANALYSIS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W77-02015

ISOTOPIC HYDROLOGY IN THE AMAZONIA 2. RELATIVE DISCHARGES OF THE NEGRO AND SOLIMOES RIVERS THROUGH O-18 CONCENTRATIONS,
Centro de Energia Nuclear na Agricultura, Sao Paulo (Brazil); and Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W77-02016

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS AND LANDSAT DATA-COLLECTION SYSTEM OPERATIONS IN CENTRAL ARIZONA,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 2C.
W77-02017

AN EVALUATION OF METHODS FOR MEASURING ALGAL GROWTH,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 5A.
W77-02018

INDEXES ASSOCIATED WITH INFORMATION THEORY IN WATER QUALITY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W77-02025

EVALUATION OF THREE COLLECTING METHODS FOR A RECONNAISSANCE OF STREAM BENTHIC INVERTEBRATES,
Geological Survey, Menlo Park, Calif., and Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W77-02028

THERMAL MODELING AND ITS RELATIO TO CANAL EVAPORATION,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 2D.
W77-02029

APPLICATION OF LANDSAT TO THE SU VEILLANCE AND CONTROL OF LAK EUTROPHICATION IN THE GREAT LAKE BASIN,
Bendix Aerospace Systems Div., Ann Arbo Mich.
For primary bibliographic entry see Field 5C.
W77-02041

APPLICATION OF LANDSAT TO THE SU VEILLANCE AND CONTROL OF LAK EUTROPHICATION IN THE GREAT LAKE BASIN,
Bendix Aerospace Systems Div., Ann Arbo Mich.
For primary bibliographic entry see Field 5C.
W77-02042

7C. Evaluation, Processing and Publication

USE OF PUNCH CARDS FOR ACCUMULA ING AND ANALYZING DATA ON THE SA TARY-EPIDEMIOLOGICAL STATE OF RUR POPULATED AREAS, (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W77-01600

BOUNDARY-LAYER TRAJECTORY ES MATES COMPARED WITH CONSTAN VOLUME BALLOON TRAJECTORIES IN T GREAT PLAINS,
National Oceanic and Atmospheric Administ tion, Silver Spring, Md. Air Resources Lab.
For primary bibliographic entry see Field 2B.
W77-01701

AN EVALUATION OF PRECIPITATION DATA FROM THE WASHINGTON, DC AR COLLECTED DURING 1975,
National Oceanic and Atmospheric Administ tion, Silver Spring, Md. Air Resources Lab.
For primary bibliographic entry see Field 2B.
W77-01703

MONITORING GROUNDWATER QUALI DATA MANAGEMENT,
General Electric Co., Santa Barbara, Calif. Cen for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01773

PROCEDURES MANUAL FOR MONITORI SOLID WASTE DISPOSAL SITES,
Wehran Engineering Corp., Middletown, N. Y.
For primary bibliographic entry see Field 5B.
W77-01774

NATIONAL EUTROPHICATION SURVE DATA ACQUISITION AND LABORATO ANALYSIS SYSTEM FOR LAKE SAMPLES,
Environmental Monitoring and Support Lab., Vegas, Nev.
For primary bibliographic entry see Field 5A.
W77-01788

ANALYSIS OF MARINE MAMMAL REMO SENSING DATA,
Johns Hopkins Univ., Baltimore, Md
For primary bibliographic entry see Field 6G.
W77-01825

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W77-01885

AN EXAMINATION OF THE RELIABILITY OF SHORT TERM RECORDS IN PRECIPITATION VARIABILITY STUDIES,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 2B.
W77-01904

LAKE SUPERIOR BATHYTHERMOGRAPH DATA,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-01912

POTENTIAL USE OF SATELLITE IR DATA FOR ICE THICKNESS MAPPING,
Development and Resources Transportation Co., Silver Spring, Md.
For primary bibliographic entry see Field 2C.
W77-01913

COLLECTION AND PROCESSING SYSTEM OF HYDROLOGICAL DATA DURING FLASH FLOODS ON THE RIVER YODO,
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 2E.
W77-01934

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIPPI RIVER BASIN--VOLUME 1. LOWER MISSISSIPPI RIVER BASIN EXCEPT ARKANSAS RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt.of Documents, GPO, Wash., D.C. 20402, price $9.60. Water-Supply Paper 2120, 1975. 1278 p, 1 fig.

Descriptors: *Hydrologic data, *Surface waters, Streamflow, *Lakes, *Mississippi River basin, Arkansas, Kentucky, Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, Texas, Basic data collections, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Average flow, Reservoirs, Reservoir stages.
Identifiers: *Lower Mississippi River basin, Maximum discharges, Minimum discharges, Reservoir content.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Lower Mississippi River basin except Arkansas River basin. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. Data for partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. For most gaging stations on lakes and reservoirs the data comprise a description of the station and a monthly summary table of stage and contents. For some reservoirs a table showing daily contents or stage is given. (Woodard-USGS)
W77-02009

GROUND-WATER RECORDS FOR SOUTHEASTERN OKLAHOMA: PART 1--RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, Okla.
J. S. Havens, and D. L. Bergman.
Open-file report, June 1976. 59 p, 26 ref.

Descriptors: *Well data, *Water levels, *Test wells, *Springs, *Oklahoma, Aquifers, Water yield, Water users, Locating, Sites, Maps, *Groundwater, *Data collections, Publications.
Identifiers: Southeastern Oklahoma.

Both published and unpublished records are presented for approximately 1,780 wells, test-holes, and springs for 16 counties in southeastern Oklahoma. In addition, selected references to pertinent ground-water reports covering parts of the 16-county area are included. (Woodard-USGS)
W77-02024

LIMNOLOGICAL SURVEY OF SACONY CREEK BASIN, BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5A.
W77-02026

HYDROLOGIC UNIT MAP--1974, STATE OF NORTH DAKOTA.
Geological Survey, Reston, Va.
Available from USGS, Reston, VA 22092, price $1.25. Hydrologic Unit Map of North Dakota, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *North Dakota, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(N Dak), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in North Dakota that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-02031

WATER RESOURCES OF THE RAINY LAKE WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
D. W. Ericson, G. F. Lindholm, and J. O. Helgesen.
Available from U. S. Geological Survey, Reston, Va. 22092, price $1.00. Hydrologic Investigations Atlas HA-556, 1976. 2 sheets, 3 figs, 17 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Minnesota, Water utilization, Hydrologic budget, Lakes, Streamflow, Aquifers, Glacial drift, Bedrock, Water yield, Water supply, *Maps.
Identifiers: *Rainy Lake watershed(Minn).

The Rainy Lake watershed is one of 39 watershed units designated by the Minnesota Department of Natural Resources for evaluation of the State's water resources. Included is an appraisal of the occurrence, quantity, quality, and availability of ground and surface waters. Fifteen percent of the watershed is lakes, 10 acres or larger, that are interconnected by a complex stream network. The abundance of surface water and the wilderness environment make the watershed unique as a recreational area. Lakes in the watershed are major controls on streamflow. They store and slowly release overland runoff, thereby sustaining flow. Surface water supplies used in thewatershed in 1971 totaled 851 million gal, more than half of which was for municipal supplies. A much larger amount was withdrawn and returned directly to streams or lakes after industrial use. Most surface waters have a dissolved-solids concentration of less than 100 mg/liter and are considered soft. Glacial drift is the most favorable source of ground water. In most areas, however, drift is less than 50 ft thick and discontinuous, thereby limiting its reliability as a source of water. Crystalline bedrock, the only alternate source of ground water, is relatively unproductive. Most ground water is of the calcium bicarbonate type, commonly hard, and, in places, contains excessive amounts of iron and manganese. (Woodard-USGS)
W77-02032

WATER RESOURCES OF THE LITTLE FORK RIVER WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
J. O. Helgesen, G. F. Lindholm, and D. W. Ericson.
Available from USGS, Reston, Va 22092, price $1.75. Hydrologic Investigations Atlas HA-551, 1976. 2 sheets, 17 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Hydrologic budget, Water utilization, Aquifers, Glacial drift, Bedrock, Groundwater movement, Streamflow, Flow rates, Floods, Lakes, Maps.
Identifiers: *Little Fork River(Minn).

The Little Fork River watershed is one of 39 watershed units designated by the Minnesota Department of Natural Resources for evaluation of the State's water resources. Included is an appraisal of the occurrence, quantity, quality, and availability of ground and surface waters. Water resources are not intensively developed anywhere in the watershed. Essentially all water used is withdrawn from ground-water sources, mainly glacial drift, which ranges from 0 to over 200 feet (61 meters) in thickness. Buried sand and gravel in the drift is the most favorable source for development. Most ground water is of the calcium or calcium magnesium bicarbonate type. The degree of mineralization generally increases downgradient in the flow system. Ground water is commonly very hard and high in iron and manganese. Lakes and wetlands have a natural regulating effect on streamflow. Water in streams is of the calcium bicarbonate type. The amount of mineralization reflects surficial geology, being greatest in streams draining glacial-lake sediments and least in streams draining areas of sand lakes. Color and iron concentration in stream waters generally exceed recommended domestic consumption limits. (Woodard-USGS)
W77-02033

STORMWATER STUDIES AND ALTERNATIVES IN ATLANTA,
Jordan, Jones, and Goulding, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W77-02073

WASTEWATER STORAGE-SIMULATION OF INSTREAM EFFECTS,
Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort.
For primary bibliographic entry see Field 5B.
W77-02074

8. ENGINEERING WORKS

8B. Hydraulics

SHUNT LINE METERING SYSTEM FOR IRRIGATION WELLS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W77-01623

NEW DEVELOPMENTS WILL CUT DRILLING TIME, EXPENSE,
Gulf Publishing Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W77-01764

MANUAL OF WATER WELL CONSTRUCTION PRACTICES.
National Water Well Association, Worthington, Ohio.
EPA Office of Water Supply, 570/9-75-001, 1975, 156 p, 6 fig, 12 tab, 7 append, 3 plates.

Descriptors: *Water wells, *Construction, *Construction materials, *Standards, *Design, Drilling, Formations(Geologic), Aquifers, Screens, Drilling fluids, Drilling equipment, Well screens, Grouting, Filtering systems, Sands, Gravels, Water sampling, Testing procedures, Test wells, Bioassay, Publications.
Identifiers: *Water well construction standards, Drilling methods, Formation sampling methods, Test holes, Casing selection, Well disinfection, Well abandonment.

The primary purposes of well construction standards are to protect the health, safety and welfare of the public; to protect ground-water resources, and the environment in general for present and future use; and to permit optimum water production from each well at minimal cost. These standars have been prepared to accomplish these purposes and to obtain the most appropriately designed well. When properly used, they will result in adequate minimum specifications for water well construction. Throughout the manual, the general plan followed is that the higher the coded number used with a specific Article the higher is the quality or design of the material or construction method used. However, special conditions may require specific and unique solutions. Equal weight is given a number of choices occasionally, since no one method may be any more efficient or effective than another for some geohydrologic conditions. These standards are designed to improve communications between the planner and the technical man in the field. They will assist planners in preparing satisfactory specifications for the majority of wells, to be drilled. (Heiss-NWWA)
W77-01777

VERIFICATION OF HYDROELASTIC SIMILITUDE CRITERIA,
Research Inst. for Water Resources Development, Budapest (Hungary). Dept. for Hydromechanics.
O. Haszpra.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. HY4, p 469-481, Proceedings paper No. 12048, April 1976. 7 fig, 16 ref.

Descriptors: *Hydraulic models, *Hydraulics, *Vibrations, Model studies, Structures, Equations.
Identifiers: *Similitude, *Similarities, *Hydroelasticity, Scale effect, Froude law.

When modeling flow-induced vibrations of hydraulic structures, in most cases the similitude of the inertial, elastic, and gravitational forces must be ensured according to the Froude law, but sometimes the gravitational force can be neglected. This paper treats the most important scale ratios. The systematic experimental verification gives instructions on the applicable geometric scale and the reliability of the prototype data determined from the model. The error of the frequencies is shown to be within + or - 10%, while that of the amplitudes hardly attains -50%. The internal damping of the model material influences the results, but in comparison with the effect of the water damping it could be neglected. (Bell-Cornell)
W77-01880

A STOCHASTIC SEDIMENT YIELD MODEL FOR BAYESIAN DECISION ANALYSIS APPLIED TO MULTIPURPOSE RESERVOIR DESIGN,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 4D.
W77-01892

A STUDY OF MOLECULAR PARAMETERS INFLUENCING POLYMER DRAG REDUCTION,
Naval Underseas Center, San Diego, Calif.
R. H. Wade.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A020 813, Price codes: A03 in paper copy, A01 in microfiche. Report NUC TP 473, July 1975. 37 p, 26 fig, 14 ref, 3 append.

Descriptors: *Molecular structure, *Polymers, *Drag, Chemical properties, Mechanical properties, Water properties, Hydrogen ion concentration, *Ionization, Flow, Polyelectrolytes, Chemistry, Hydraulics.
Identifiers: *Drag reduction, Molecular parameters, *Chain branching, *Cross-linking, Flow noise.

Three parameters, chain branching, ionization, and cross-linking, were studied for their effect on drag reduction in turbulent flow. Drag reduction was shown to increase as polymers are altered with long branches but to decrease as larger numbers of shorter branches are attached. Linear polymers too low in molecular weight for inherent drag-reduction capability became effective drag reducers through the grafting of long branches. Larger polymers had their drag reduction destroyed by the addition of many short branches or enhanced by the addition of fewer, but longer, branches. The drag-reduction function of polyelectrolytes was reversibly destroyed or enhanced by changes in configuration resulting from changes in pH or ionic strength or by complexing with counter-ion polyelectrolytes. The effects of counter-polyion complexing were related to reversible cross-linking and branching as stoichio-metric ratios were varied. Cross-linking was shown to be an effective method to produce large drag-reducing molecules. Drag reduction was completely destroyed by excessive cross-linking. Under actual conditions of drag reduction in turbulent flow, polymer degradation was somewhat less in branched and cross-linked molecules than in linear ones. (Sims-ISWS)
W77-01915

8C. Hydraulic Machinery

NONAXIAL UPLIFT TESTS ON STRAIGHT AND BELLED AUGER MODEL FOOTINGS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8G.
W77-01683

A MATHEMATICAL MODEL FOR PREDICTING RIVER TEMPERATURES-APPLICATION TO THE GREEN RIVER BELOW FLAMING GORGE DAM,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 4A.
W77-01684

SELECTING HYDRAULIC REACTION TURBINES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
R. N. Walters, and C. G. Bates.
Office of Design and Construction, Water Resources Technical Publication, Engineering Monograph No. 20, 1976. 49 p, 40 fig.

Descriptors: *Hydroelectric powerplants, *Hydraulic machinery, *Hydraulic turbines, *Turbine runners, *Turbines, *Draft tubes, Cavitation, Francis turbines, Power head, Governors, Performance.
Identifiers: *Spiral cases, *Turbine efficiency, Cavitation index.

This revised monograph reflects modern trends in the selection of hydraulic reaction turbines. Figures are included which show characteristics of the turbine in relation to various parameters for estimating size and predicting performance of the unit. (Bureau of Reclamation)
W77-01685

AN INVESTIGATION OF TECHNIQUES TO EXPEDITE SYNCHRONIZING FOR PUMP-STORAGE UNITS AND STANDBY GENERATING UNITS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
F. R. Schleif.
April 1975. 37 p, 11 fig, 3 tab, 10 ref, append; Experimental Verification, Phase 2, Nov.1975, May 1976, 46 p. Bur Recam 5-01-ER-01779.

Descriptors: *Electric generators, *Pumped storage, California, *Generators, Electrical equipment, Hydroelectric power.
Identifiers: *Synchronizers, *San Luis pump-storage plant(Calif).

The rapid startup potential of hydro and pumped storage power is placed at a premium by the increasing preponderance of thermal power sources which inherently have rather sluggish response. To better exploit the rapid startup potential, the latitudes and constraints of synchronizing are examined and means are developed to expedite the synchronizing process. A special synchronizer is developed with compensation for acceleration and with sensitivity to residual voltage. By this means transients of induction synchronizing are reduced, pull-in torque may be increased, and full voltage synchronizing may be achieved at higher acceleration and in less time for start up of emergency standby units. (Bureau of Reclamation)
W77-01686

SELF-REGULATING TIDE GATE,
Rockwell (W. S.) Co., Fairfield, Conn. (Assignee).
M. Mirto, Jr.
U.S. Patent No. 3,974,654, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 949, No 3, p 907, August 17, 1976.

Descriptors: *Patents, *Gates, *Engineering structures, Flood gates, Barriers, Flow control, Gate control, Tidal marshes, Tidal waters.
Identifiers: Tide gates.

A relatively simple and inexpensive tidal flow device which would permit full tidal flow through a dike but which would stop this flow automatically at a predetermined water level to avoid tidal flooding is described. The device for controlling the flow of water from a conduit open end into a wetland or reservoir is comprised of a flow control

gate which is pivotally mounted at its lower edge upon a horizontal axis in the vicinity of the bottom of the conduit opening. The gate is pviotable upward against the coduit opening to a closed position. A bracket extends from above the conduit and has a slot which is substantially parallel to the longitudinal axis of the conduit. A rod is pivotally connected to the top of the gate and extends upward through the bracket slot. A float is positioned on the rod above the bracket so that, as the level of the water in the tidal body rises, the float will rise to pivot the gate upward toward the closed position. This gate can be closed manually in the event of an advanced storm warning when reserved water volumes are necessary in order to reduce storm sewer flooding in the areas adjacent the marsh. (Sinha-OEIS)
W77-01728

WATER GATE,
R. L. Halpern, and C. L. Skiles.
U.S. Patent No. 3,974,655, 5 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 907, August 17, 1976.

Descriptors: *Patents, *Gates, *Engineering structures, *Barriers, *Flow control, Water pollution control, Gate control, Balloons, Pumps, Florida.
Identifiers: Water gates, Water balloons.

To permit a pollution-free connection of a polluted with an unpolluted body of water or an estuary or stream, a pair of gates is provided which will confine the pollutants to the polluted body of water and prevent their dissemination to or intrusion into connected bodies of water which would otherwise be pollution-free. The devices are acceptable to pollution control authorities in the State of Florida where the problem is of wide extent. As two types of gate are shown in this application the first will be referred to as the 'balloon type' and the second as the 'shutter type'. A waterway has side recesses on either side and a bottom recess for lodgment of the balloon when the gate is open. The water balloon is in collapsed position when the waterway is open. To close the gate a pump pumps water into the balloon to expand its dimensions to form a closure. To reopen the gate the action of the pump is reversed. The shutter type gate uses an air compressor and tank to inflate the balloon which raises a shutter to close the waterway. (Sinha-OEIS)
W77-01729

DRIP IRRIGATION VALVE WITH SPRING BIASED PLUNGER,
For primary bibliographic entry see Field 3F.
W77-01731

SYSTEM FOR UTILIZING ENERGY IN A FLUID CURRENT,
D. Z. Bailey.
U.S. Patent No. 3,978,345, 7 p, 8 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 949, No 5, p 2135, August 31, 1976.

Descriptors: *Patents, *Energy, *Currents(Water), *Flow, Movement, Running waters, Energy conversion, Equipment, Hydraulic structures.
Identifiers: Power generation.

The system comprises a firmly anchored strong cable suspension which spans a flowing stream of water. At spaced intervals on the cable suspension, flotation barges are attached to assure a rather stable and uniformly supported stretch of the suspension cable system across the stream. A corresponding number of rotors are suspended from the flotation barges with their rotational axes transverse to the stream current and the rotors turning in generally vertical planes. Intervened with the flotation barges and rotors and pivotally mounted on individual suspension cables are lifting foils and associated controls for cyclically regulating the angles of attack of the foils relative to the current and for assuring a relatively constant resultant lift force from each foil during its complete rotational cycle. The resultant forces produced through the foil elements generate unidirectional rotation of the rotors with the suspension cables, and the rotor movement in turn activates useful power generating means. (Sinha-OEIS)
W77-01752

DOUBLE-FLOW MAGNETIC FILTER, APPARATUS AND METHOD,
Kraftwerk Union A.G., Muelheim an der Ruhr (West Germany). (Assignee).
For primary bibliographic entry see Field 5F.
W77-01758

EVALUATION OF EFFECTIVENESS OF RESERVOIR DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-01821

8D. Soil Mechanics

METHOD OF PROTECTING A PILE IMBEDDED IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD,
Union Oil Co. of California, Brea. (Assignee).
G. P. Maly, and C. A. Tannahill.
U.S. Patent No. 3,972,198, 7 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 54, August 3, 1976.

Descriptors: *Patents, *Engineering structures, *Soil mechanics, *Piles(Foundations), Coastal structures, Movement, Flow, Mud, Mudflows, Engineering geology.
Identifiers: Offshore technology, Sediment properties, Geotechniques.

A method is described for protecting a stationary rigid pile extending through a layer of mud suceptible to movement and imbedded in an underlying competent bottom from the forces that a moving layer of mud can exert against the pile, and for reducing the forces that a moving layer of mud is exerting against the pile. Fluid is ejected from the interior of the pile above the competent bottom into the mud adjacent to the pile. The fluid will be ejected at a volumetric rate sufficient to adequately increase the fluid content of the mud, i.e., fluidize the mud, thereby increasing the lubricity of the mud and reducing the abrasiveness, cohesiveness and shear stress of the mud adjacent to the pile, with a resulting reduction in the forces that the moving layer of mud can exert against the pile. (Sinha-OEIS)
W77-01711

PORE PRESSURES NEAR MOVING UNDERWATER SLOPE,
Waterloopkundig Laboratorium, Delft (Netherlands).
K. L. Meijer, and A. G. van Os.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. GT4, p 361-372, Proceedings paper No. 12021, April 1976. 5 fig, 1 tab, 15 ref.

Descriptors: *Underwater, *Slopes, *Pore water, *Pressure, *Consolidation, Soil mechanics, Dredging, *Pore pressure.
Identifiers: *Dilatancy, Finite differences.

Pore pressures near a moving boundary of a saturated soil mass are calculated and compared with tests. For a more realistic approximation of the stress-strain behavior of soil, a dilatancy effect has been introduced that is based upon Rowe's stress-dilatancy relation and the assumption of a linear relationship between the principal stress ratio and the major principal strain. The field equations for the problem have been transformed to account for the traveling boundary. A pseudo three-dimensional consolidation theory is used to describe the fluid-soil skeleton interaction. The results of the computations have been compared with pore-pressure measurements and show reasonable agreement if dilatancy is accounted for. (Bell-Cornell)
W77-01879

8F. Concrete

NEW DEVELOPMENTS WILL CUT DRILLING TIME, EXPENSE,
Gulf Publishing Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W77-01764

OPTIMIZING SELECTION OF MARINE RETAINING WALLS,
Mueser, Rutledge, Wentwork and Johnston, New York.
R. C. Johnston, M. Bernheimer, and D. A. Zarrella.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. GT12, Proceedings paper No. 12624, p 1209-1224, December 1976. 7 fig, 2 tab.

Descriptors: *Bulkheads, *Land use, *Retaining walls, *New York, Harbors, Costs, Concrete construction, Sheet piling, Shore protection, Optimum development plans, Economics, Estimating, Projects.

The factors involved in selecting an appropriate perimeter bulkhead or retaining structure for waterfront developments are examined with particular emphasis on conditions in New York Harbor. The selection process is illustrated by descriptions of two recent cases. For Battery Park City, considerations of moderate first cost, low maintenance, and long life lead to the choice of a low-level relieving platform above a stone embankment for the perimeter structure. At Northeast Marine Terminal, retaining structures included a sheet pile wall, circular cells, and a relieving platform, each adapted to existing conditions to minimize first cost and yet provide necessary stability and a medium length usable life. (Bell-Cornell)
W77-02072

8G. Materials

SHUNT LINE METERING SYSTEM FOR IRRIGATION WELLS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
W. C. Hill, and J. F. Ruff.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 494-500, May-June 1976. 15 fig, 2 tab, 5 ref.

Descriptors: *Flow measurement, *Wells, *Irrigation wells, *Orifices, Calibrations, Laboratory tests, Equations, Mathematical studies, Instrumentation, Measurement, Pipes.
Identifiers: *Shunt line meter.

The testing and development of a shunt line metering system with segmental orifice were described. This type of metering system provides a low cost means of cumulatively measuring the volume of water discharged from irrigation wells. The flow through the shunt line, which was measured by a small household type water meter, was related to the flow through the main irrigation pipe by a flow coefficient which was experimentally determined for a 15.41 cm (6 in) pipe. This flow coefficient is a

function of the degree of orifice contraction. It was pointed out that the field calibration of the meter was not necessary. The cost of the metering system can be less than $100, and the accuracy was shown to be within + or - 5%. (Bhowmik-Isws)
W77-01623

SNOW-ROAD CONSTRUCTION--A SUMMARY OF TECHNOLOGY FROM PAST TO PRESENT,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
For primary bibliographic entry see Field 4C.
W77-01638

EVALUATION OF THE USE OF SALT BRINE FOR DEICING PURPOSES,
Connecticut Dept. of Transportation, Rocky Hill, Materials Testing Lab.
For primary bibliographic entry see Field 4C.
W77-01639

NONAXIAL UPLIFT TESTS ON STRAIGHT AND BELLED AUGER MODEL FOOTINGS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
J. Merriman.
Report REC-ERC-76-9, June 1976. 21 p, 15 fig, 3 tab, 2 ref.

Descriptors: Uplift pressure, Laboratory tests, *Transmission towers, Soil mechanics, Strain gages, Strain measurement, Design, Model studies, Testing procedures.
Identifiers: *Belled footings, *Auger-type footings, Pull-out tests, Anchored towers.

A second series of model tests has been conducted to expand on data previously obtained on pullout forces on belled and straight auger footings used for transmission line towers. This test was performed to determine the effect of different angles of pullout on the load resistance of these two footing types which were cast-in-place in a compacted silty clay. The tests were performed on instrumented, reinforced concrete model footings. The results show that the greatest load resistance is obtained with a belled footing and also is greater when the pullout force is at an angle. (Bureau of Reclamation).
W77-01683

USE OF OUTER BARS OF INLETS AS SOURCES OF BEACH NOURISHMENT MATERIAL,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W77-01708

LOW ADHESIONAL ARCTIC OFFSHORE PLATFORM,
Chevron Research Co., San Francisco, Calif. (Assignee).
T. A. Hudson, and G. E. Strickland, Jr.
U. S. Patent No. 3,972,199, 14 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 55, August 3, 1976.

Descriptors: *Patents, *Engineering structures, *Offshore platforms, *Ice, *Ice-water interfaces, *Ice loads, Pressure, Coatings, Protective coatings, Films, Adhesion.
Identifiers: Offshore technology.

A method is provided for preventing the natural ice from freezing on or strongly adhering to the surfaces of the offshore structure exposed to the water in the zone of natural ice formation. Heat is applied to the inner or outer surface of the outer wall or shell of the structure, particularly adjacent the water line, where the natural ice will tend to freeze onto or impinge against the shell. The temperature of the outer surface of the shell will be maintained above the melting point of the ice. The heat can be applied continuously to prevent adhesion of ice to the shell and to provide a film of water between the ice and the outer surface of the shell to assist the ice in slipping over and upon this surface to reduce the force imposed on the structure by moving ice sheets. The exterior of the shell is coated with a material that reduces ice adhesion such as halocarbon resins. The coating supplants or assists the film of water while at the same time reducing the adhesional bond between the ice and the material. The material can function as a backup on an emergency situation where the heating system fails. The material also reduces the amount of heat needed since the adhesional bond is significantly reduced as a result of the coatings. (Sinha-OEIS)
W77-01712

WATER CONDITIONING DEVICE,
Marian Co., Chicago, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W77-01727

NEW DEVELOPMENTS WILL CUT DRILLING TIME, EXPENSE,
Gulf Publishing Co., Houston, Tex.
T. R. Wright, Jr.
World Oil, Vol. 183, No. 5, p 79-83, October, 1976. 9 fig.

Descriptors: *Drilling equipment, *Wells, Drilling, *Oil wells, Cements.
Identifiers: *Continuous drill string, *Vibrating pile driver, *Flex-joints, *Cementing system.

Drilling in the United States and abroad is continuing at a high rate. As a result of the efforts of operators, drilling contractors and equipment suppliers, some new ideas have been developed including the following. A new portable land rig equipped with a 2 3/8-inch continuous string of pipe, designed and manufactured by Uni-Flex Rig Company, Ltd. of Brooks, Alberta, to quickly dig shallow (3,000 foot maximum) wells. The highly mobile rig requires only a single load when earthen pits are sued and weighs only about 75,000 pounds, excluding the truck. The rig can be operated with a two-man crew and make trips at about 100 fpm. An efficient, quieter system for driving oil well conductor pipe was recently used. Thums Long Beach Company used the vibratory pile driver, which was estimated to reduce decible range by about one-half when using alternative methods. A new oil well cementing system has been developed which allows virtually any cement job to be blended, mixed and pumped on the rig using neat cement and liquid additives. Main advantages are a reduction in time lost waiting on delivery of cement from onshore facilities and a reduction in the amount of cement wasted. Lord Kinematics Marine Products Group of Erie, Pennsylvania, has developed a new flex-joint. By using laminated rubber and metal seals in the joint, the need for complex hydraulic systems previously required for balancing internal and external pressures is eliminated. Laminated reduces bending stresses, allows motion, reacts to high tensile loads, and eliminates sliding wearing surfaces. (Grober-NWWA)
W77-01764

MAKING DOWNHOLE MEASUREMENTS THROUGH MODIFIED DRILL PIPE,
Shell Development Co., Houston, Tex.
E. B. Denison.
World Oil, Vol. 183, No. 5, p 86-89, 94, October, 1976. 8 fig, 3 ref.

Descriptors: *Monitoring, Sampling, *Electrical well logging, Water wells, *Measurement, Drilling, Data collections, Drill holes, Drillers logs, Drill samples, Drill monitors.
Identifiers: *Downhole parameters, *Electrical data collecting, Borehole surveying, Electrical data transmission, *Drill pipes.

The ability to continuously monitor downhole parameters while drilling has great utility for safety, logging, borehole surveying and drilling optimization. Shell Development Company, Houston, has designed a new type of drill pipe that is used as an electrical circuit to transmit from the downhole measuring device to the surface. The system uses electrical data transmission, which makes it possible to simultaneously monitor dozens of downhole parameters. A frequently cited disadvantage of integral-circuit drill pipe is shorting potential due to multiple connections however, field test results are very encouraging. The drill pipe circuit reliability equaled expectations. The problems that developed were minor. Field testing of the complete system should be accomplished during 1976, along with additional long-term integrity testing of a limited number of joints of the special drill pipe. (Grober-NWWA)
W77-01766

THE CABLE TOOL BIT,
National Water Well Association, Worthington, Ohio.
R. B. McDannald.
Water Well Journal, Vol. 30, No. 10, p 18-19, October, 1976.

Descriptors: *Drilling equipment, Limestones, Fissures, Sandstones, Granites, Shales, Water wells, Drilling.
Identifiers: *Cable tool drilling, *Drill bit, California type bits, Mother hubbard bit, Twisted blade bit, Spudding bit, Offset bit, Star bit.

The drill bit, one of the more important tools in the drill string, does the actual drilling. It consists of a cutting edge, body in which water channels are formed, and a pin joint on its upper end. The bottom of the bit is flared out from the body section and conforms to the gauge diameter of the hole to be drilled. The length of the bit determines its weight. Eight important factors should be considered in designing and shaping the bottom of a bit; angle of penetration, angle of clearance, wearing surface, reaming edge, area of crushing face, area of water course, contour of penetrating edge and cross section of drill bit. Each factor has its usefulness, whether it be penetrating, crushing, reaming or mixing, depending on the type of rock formation to be drilled through. It is always desirable to include pairs of bits in the tool equipment. Including four or six bits of each diameter, and at least 2 of each type, will prove economical by keeping the drilling machine in steady production. (Grober-NWWA)
W77-01767

HOW TO DRILL A USABLE HOLE, PART 3 SELECTING THE DRILL COLLAR STRING,
Drilco, Houston, Tex.
G. E. Wilson, and W. R. Garrett.
World Oil, Vol. 183, No. 5, p 99-102, October, 1976. 5 fig.

Descriptors: *Drilling equipment, *Drilling, Boreholes, Wells, Construction costs, *Design.
Identifiers: *Drill collars, Drill collar design, Thread connection, Special designs.

The proper selection of a drill collar string is important to obtain a trouble free, usable borehole at minimum cost. The drill collar provides bit weight in the amount needed, assists in obtaining and maintaining desired hole direction, and insures prolonged drill pipe life and performance. Drill collars are available in many combinations of size and thread types. Selection of the size and type of collar should be based on the size of hole to be drilled and the subsurface conditions expected to be encountered. When selecting connections it should be noted that the design of the best rotar

houldered connection for a drill collar calls for he pin and box to be balanced in bending fatigue. Other consideration in the drill collar selection rocess are special features. Popular special features include fishing necks, stepped bores, slip and levator recesses and spirial grooving. (See also W76-11915) (Heiss-NWWA)
W77-01768

MANUAL OF WATER WELL CONSTRUCTION PRACTICES.
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 8B.
W77-01777

8I. Fisheries Engineering

A MATHEMATICAL MODEL FOR PREDICTING RIVER TEMPERATURES-APPLICATION TO THE GREEN RIVER BELOW FLAMING GORGE DAM,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 4A.
W77-01684

MOVEMENTS OF TAGGED JUVENILE MENHADEN (BREVOORTIA PATRONUS) IN THE GULF OF MEXICO,
National Marine Fisheries Services, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
L. L. Kroger, and P. J. Pristas.
Texas Journal of Science, Vol. 26, Nos. 3-4, p. 473-477, 1975. 1 fig., 1 tab., 7 ref.

Descriptors: *Tagging, *Fish migration, *Gulf of Mexico, Commercial fishing, Juvenile fish, Estuaries, Mississippi, Louisiana, Texas, Fish management.
Identifiers: *Menhaden.

Movement of juvenile Gulf menhaden were investigated in order to improve methods of predicting incoming year-class strength and recruitment of 1-year old menhaden to the commercial fisheries. A total of 9,912 juveniles were tagged and released in 11 estuaries from Brownsville, Texas to Pensacola, Florida. Tags which were recovered in menhaden reduction plants, indicated that most 1-year old menhaden return to the fishing area near the estuaries where they were produced. Juvenile menhaden produced in estuaries west of the Mississippi River Delta did not occur in significant numbers as 1-year old fish in waters east of the Delta and vice versa. These results indicate that the recruitment of 1-year old menhaden to each of the three commercial fishing areas is dependent on the number of juveniles produced in estuaries in and adjacent to each fishing area. The hypothesis that menhaden produced in the extreme western and eastern Gulf estuaries contribute as 1-year fish to the catches made in the western and eastern fisheries, respectively was only partially supported because tags were not recovered from several sites. Initial returns of a followup tagging study have yielded similar results. (Luedtke-Wisconsin)
W77-02066

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

DIRECTORY TO U.S. GEOLOGICAL SURVEY PROGRAM ACTIVITIES IN COASTAL AREAS, 1974-76,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2L.
W77-02011

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10C. Secondary Publication And Distribution

1975 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 05D.
W77-01678

ASSESSMENT OF AVAILABLE LITERATURE ON EFFECTS OF OIL POLLUTION ON BIOTA IN ARCTIC AND SUBARCTIC WATERS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 05C.
W77-01871

DIRECTORY TO U.S. GEOLOGICAL SURVEY PROGRAM ACTIVITIES IN COASTAL AREAS, 1974-76,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 02L.
W77-02011

BIBLIOGRAPHY AND SELECTED ABSTRACTS OF REPORTS ON WATER RESOURCES AND RELATED SUBJECTS FOR ARKANSAS THROUGH 1975,
Geological Survey, Little Rock, Ark.
R. T. Sniegocki.
Arkansas Geological Commission Little Rock, Water Resources Summary No 10, 1976. 237 p.

Descriptors: *Water resources, *Arkansas, *Publications, *Bibliographies, *Abstracts, Groundwater, Surface waters, Hydrogeology, Documentation, Information retrieval, Alluvial aquifers, Analytical techniques, Chemial analysis, Methodology, Planning, Water supply.

Reports prepared on water resources and related subjects for Arkansas through 1975 are listed in this bibliography. Those reports that pertain specifically to water are followed by annotation. A subject index of more than 350 entries will aid in determining the extent of coverage of specific subjects. (Woodard-USGS)
W77-02014

10D. Specialized Information Center Services

HYDROLOGICAL AND HYDRAULICAL CONCEPTUAL MODELS APPLICABLE TO OVERLAND AND RIVER TRANSPORT MODELING,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W77-02036

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)-YEAR FLOOD
A Report to the New England River Basins Commission on Non-Structural Measures for Flood Plain and Flood Damage Management with Application to the Connecticut River Basin Supplemental Flood Management Study. Phase II. The Formulation and Evaluation of Specific Alternatives,
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)-YEAR FLOOD
A Report to the New England River Basins Commission on Non-Structural Measures for Flood Plain and Flood Damage Management with Application to the Connecticut River Basin Supplemental Flood Management Study. Phase II. The Formulation and Evaluation of Specific Alternatives,
W77-01696 6F

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W77-01580 5D

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Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-01987--02005 02007--02008	21
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
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